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IJMS INTERNATIONAL JOURNAL *of* MEDICAL STUDENTS

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IJMS INTERNATIONAL JOURNAL *of* MEDICAL STUDENTS

The *International Journal of Medical Students* (IJMS) is a peer-reviewed, open-access journal created to share the scientific production and experiences of medical students worldwide. Our objective is to be the primary diffusion platform for medical students, using standards that follow the process of scientific publication.

The Journal receives contributions and unpublished manuscripts of Original Articles, Short Communications, Reviews, and Case Reports, which are reviewed by experts (Peer-Reviewers) who have previously published similar research. In addition, the Journal accepts Interviews, Experiences, and Letters reviewed by the Editorial Team. This supports the quality and validity of the publications. The time between submission and final publication in most cases has been two to four months depending on the diligence of Peer-Reviewers and Authors.

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IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

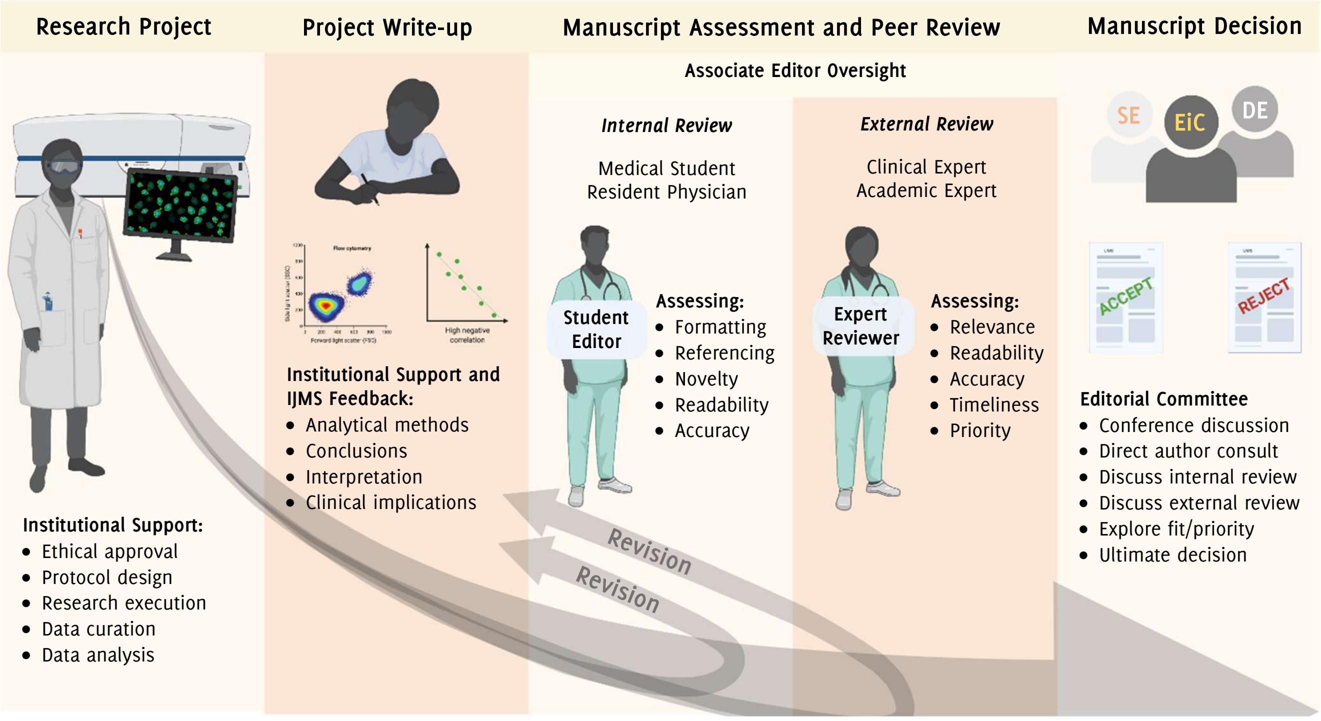
More than a Manuscript: The International Journal of Medical Students as an Educational Institution

Paul MacDaragh Ryan.[1,2]

The inherent importance of research pursuits within the medical community is a readily emphasized but often modestly instructed aspect of medical training and professional development. Learners often report widely varying degrees of opportunity, guidance and supervision across curricula and institutes (*e.g.*, protocol design, research ethics training, data curation and analysis instruction; ***Figure 1***).[1] [2] However, an expectation that graduates will automatically become capable researchers with the ability to produce or contribute to high-quality evidence persists. This occasional discrepancy between preparations and expectations leaves many first-time authors floundering and this, in my opinion, is where the *International Journal of Medical Students* demonstrates its exceptional value.

There are several aspects of the *IJMS* publication process which are unique to it as a journal and make it an unparalleled resource not only for dissemination of high-level undergraduate research output, but also for direct training of learners – submitters and assessors alike. The *Journal* is therefore, more than just that. It is also a medical education institution which affords undergraduates the supervision, feedback and training required to bring their hard-work up to a caliber suitable for peer review and potentially international dissemination. For example, the role of the Student Editor is central to the success of *IJMS* (***Figure 1***). Student Editors, who are typically medical students or occasionally resident physicians, are responsible for the initial assessment of each of the ~30 submissions received by the *Journal* every month. Not only does this ensure the quality of submissions sent out to experts for external review, but it also serves to educate authors on the appropriate presentations of their research. This additional layer of oversight often affords authors who may have otherwise received an immediate desk rejection an opportunity to standardize their presentation and revise to a level appropriate for peer review. The process thereafter largely follows a traditional route to publication, with external expert review and ultimately, a senior editor decision; however, the delivery and content of assessments is notably different, as we aim to maintain an entirely constructive approach to feedback within the *Journal*.

Figure 1. The Publication Process of the International Journal of Medical Students Aims to Maintain Quality of Submissions and Educate Early Career Authors.



Legend: *The additional layer of internal review which Student Editors provide is key to the success of the Journal. This allows for essential feedback early on in the process which may ultimately bring a manuscript up to the level required for traditional external peer review. SE, Scientific Editor; EiC, Editor in Chief; DE, Deputy Editor.*

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Primarily as a result of the efforts of the present Scientific Editor, Dr Mihnea-Alexandru Găman, and Editor in Chief, Dr Francisco Bonilla-Escobar, standards at the *Journal* have been raised to new heights in the past few years. This current issue, which will increase the publication frequency from thrice-yearly to quarterly, is a testimony to this ever-increasing quality. However, this elevated bar pertains not only to the quality and quantity of work submitted to and published by the *Journal*, but also to the constructive quality of the review process itself. Our reviewers and editors have now been formally trained to perform high-quality, standardized reviews which aim to leave the author with a clear and impartial guide to the improvement of their manuscript. New editors undertake a probation period during which they are assessed for the strength of their reviews and their ability to manage task and meet deadlines. We have also introduced a greater degree of senior oversight, with each article undergoing final review for quality, relevance and priority Executive Committee conference (***Figure 1***).

It has been a full presidential term of office since my relationship with the *IJMS* was sparked. When I first discovered and submitted an article to the *IJMS*, I had just finished the first year of my graduate entry medicine program and I was eager to encourage any similarly minded fellow scientists to answer the inner monologue urging them to pursue a patient-facing clinical career.[3] The ethos and purpose of the *Journal* impressed me such that I soon after applied to become part of the team, taking up a role as an Associate Editor in November 2017. I have spent the last 12 months as the Deputy Editor of this truly international affair, as we aimed to rejuvenate, expand and develop the managing editorial team both in size and ability. However, the contribution which I am most proud of is the promotion of the *Journal* within my home institution, University College Cork, where over half a dozen current students and alumni have since contributed significant time, effort and expertise to *IJMS*.

In these past four years, my contributions and investments in the *Journal* have been vastly dwarfed by the returns. This educational institution has taught to me the roles, responsibilities and continuous pressures of a journal editor, and have introduced to me a diverse, international set of friends, collaborators and colleagues. As *IJMS* continues to evolve and thrive as a journal, I know that its role as an educational institution will only grow further.

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ULS

IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Editorial

Unmasking the Healthcare Issues Slipping through the Cracks during the Pandemic

Manas Pustake,[1] Ciara Egan,[2] Annora A. Kumar.[3]

There is a momentum that has started to pick up speed in the International Journal of Medical Students (IJMS) community. In the past year, we have increased our number of our Student Editors and raised the standard that we hold them to via Publons Academy, now Web of Science Academy (https://webofscienceacademy.clarivate.com/learn). Moreover, we are aware that you, our community of medical students, are moving along with us. Just a few months ago, our last editorial was a figurative call to action for us to enter into a new era of excellence in medical student research.[1] By all means did you respond. The activity and submissions we have from medical students is at an all-time high, including the quality of original research and articles.

The IJMS has always and will continue to do the honor of publishing inspirational research for medical students, by medical students. We want to highlight a particular article in this Issue that stands out. Katherine Hoops and her professors from Wayne State University School of Medicine in Detroit, Michigan, took an innovative approach in designing an educational module with the purpose of teaching medical students the basic needs of sexual assault patients. They aimed to determine if there was a substantial difference in preparedness of the medical students to counsel survivors of sexual assault.[2]

In the wake of the increasing incidence of crime and interpersonal violence associated with the COVID-19 pandemic,[3] sexual assault is a topic that demands the attention of all healthcare providers. Even in the early stages following the World Health Organization declaring COVID-19 as a pandemic, the United Nations stated a warning regarding potential growth in domestic violence as a result of the lockdown.[4,5] Furthermore, it has been established that the COVID-19 pandemic has indeed intensified pre-existing societal issues for survivors of violence, including intimate partner violence and sexual assault.[6] In spite of these factors, there has been a drop in the number of reported of sexual assault cases during the pandemic. One study found a 53% decrease in reporting of sexual assault cases and a 48% reduction in reporting of physical assault cases.[7] Additionally, the implementation of lockdowns tended to decrease the number of calls to rape crisis hotlines.[8]

Unfortunately, the topic of sexual assault is one that is still considered taboo in many societies. Because of this, many survivors of sexual assault remain silent. Even in ordinary circumstances, two in every three assaults go unreported.[8] This is highly problematic for physicians and other service providers. In a profession where we are taught to make inferences based on observable signs and patient-reported symptoms, survivors of sexual assault may remain hidden and out of the view of the average physician. Now that the lockdown restrictions are lifting, there is a need to bring such patients into the light and provide empathetic assistance and care to these patients.[7] This is something that young, aspiring physicians should be aware of.

This theme of uncovering an under-recognized healthcare issues is evident throughout much of volume 9, issue 2. Derderian et al. uncover the challenges faced by homeless veterans in the United States, a group who often slip through the cracks in the healthcare system.[9] Lack of established sense of place is an immeasurable yet essential component of wellbeing, and in this issue we also get to read about a focus group with Black students regarding the perception of belonging.[10]

In a more clinical light, this issue also illuminates the significance of refractive errors that are hidden from both the patient and the physician. A study from the Centro Universitário Saúde ABC/FMABC describes the prevalence of ametropias and highlights uncorrected refractive errors as one of the main causes of poor vision among medical students.[11] Accurate clinical information is indispensable when attempting to unveil and treat a patient's morbidity, and this importance is emphasized in the cross-sectional study on Type II Diabetic patients done by Thomas et al. and the effectiveness of blood glucose self-monitoring.[12] Additionally, a literature review commenting on the knowledge gaps of General Practitioners in implementing advanced care planning is getting published in this issue as well.[13]

This issue also explores the quantifiable effects of the pandemic. Diebel et al. evaluated the response of Canadian Emergency Departments to the pandemic.[14] Amna Raja shared an experience piece on the current COVID-19 situation in Pakistan.[15] There are also other thought-provoking experiences in this issue. In a piece that emphasizes the importance of taking initiative amidst uncertainty, Holly Brownlee narrates her experience of how she handled a case of emergency on-board flight, as a medical student.[16] Furthermore, Marcel Blignaut recounts his personal experience as a medical student as he navigated his way through a chronic disease.[17] His medical school experience is tremendously motivating for all medical students, and he also emphasizes the importance of support systems, which are strengthened by the sharing of individual stories and experiences, as he has done in his experience piece. The importance of strong peer supports is also emphasized in final article in this issue, which is an insightful letter to the editor.[18]

As well as original articles, case reports, experience pieces, and letters, no journal's issue is complete without interesting cases. So, in order to pique your curiosity, we have two fascinating cases. The first is a spinal cord injury-induced osteoporosis,[19] which highlights the interesting connections between neural pathology and bone disease. The second case describes Familial Hyperinsulinism due to HNF4A Deficiency coupled with premature adrenarche.[20]

IJMS has been publishing its issues tri-annually for the past nine years. Due to overwhelming enthusiasm and support from medical students all around the world, as well as a significant increase in submissions, we have decided to publish four issues every year from now on. The journal's mission of spreading science and research in times of the COVID-19 pandemic was proclaimed in an editorial in the first issue of last year. This has now come to fruition, as seen by the enormous number of responses and submissions despite the pandemic.[21]

As a journal, we encourage all medical students to publish and express themselves. We encourage you to come forward and contribute your thoughts and research. IJMS looks forward to continuing to provide a platform for medical students all around the world. Finally, good editors are responsible for the reputation of good journals. Paul is leaving his position as our Deputy Editor to pursue a residency in Pediatrics at The Hospital for Sick Children in Toronto, Canada. This is a huge loss for the Journal but with Paul's insight the Journal has grown stronger.[22] We wish him the best of luck in his future endeavors as a physician-scientist and future pediatric endocrinologist.

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Original Article

Prevalence and Progression of Ametropias in Medical Students

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Abstract

Background: Uncorrected refractive errors (Myopia, Hyperopia and Astigmatism) are one of the main causes of poor vision, attributing to 43% of vision deficiencies. Myopia is the most common visual disorder in the world and can progress up until the age of 20-25, when many people are in university. The etiological factors that cause myopia are still unclear and deserve to be studied. Our aim was to identify the prevalence of ametropias and self-perception of ophthalmic health in medical students at the Centro Universitário Saúde ABC/FMABC. **Methods:** This is a cross-sectional study with data collected at Centro Universitário Saúde ABC/FMABC from medical students. A total of 232 students participated in the survey, from the 1st to the 4th year of study. Data was obtained through a questionnaire, which evaluates ophthalmologic health, ametropia, and self-perception. **Results:** It was observed that 74.57% of the students had some type of ametropia, myopia being the most recurrent (59.05%). The study shows significant data of an increase in the grade of students from 1st to 4th grade throughout college. It was observed that the average daily study time of the students was 9.68 hours and abuse in the use of electronic devices. **Conclusion:** This study presented a high prevalence of ametropias among medical students at the Centro Universitário ABC/FMABC, in addition to a high prevalence of multifactorial myopia and an increased need to update their diopters (degrees) during the course of university.

Key Words: Refractive errors; Medical students; Brazil. (Source: MeSH-NLM).

Introduction

The promotion of eye health is a basic principle in increasing the quality of life because a better visual capacity allows the development of capabilities, improvement in school performance, and full participation in society.[1] According to the World Health Organization (WHO),[2] uncorrected refractive errors (Myopia, Hyperopia and Astigmatism) are one of the main causes of low vision, attributing 43% of vision deficiencies.[3]

Myopia is the visual disorder that deserves to be highlighted in this scenario. It is a pathology in which the image is focused before it reaches the retina, causing distant images to be visualized with low clarity. It is estimated that by 2020 the prevalence of myopia will be 23% in the world population, and by 2050 that prevalence will be about 50%.[4] In Brazil, this prevalence varies from 11% to 36%, representing approximately a population between 22 and 72 million people.[5]

Despite the high prevalence in the population, the development of refractive errors is still an unclear issue, mainly regarding the possible etiological factors.[6] As much as heredity is known as the main factor influencing the development of a refractive disorder, lifestyle appears to be a factor of great attention for ophthalmologic studies. The excessive utilization of vision for studies, which includes frequent and regular reading, in addition to studies with a continuous focus, apparently also constitute a risk factor.[7, 8]

Thus, studies describe a high prevalence of refractive errors in students from various fields.[9] Among the most prevalent groups are medical students, who due to a lifestyle with intensive studies for several years, constitute a group at risk for myopia and worsening of vision after the beginning of the study.[9, 10] Thus, the present work aims to identify the prevalence of ametropias (refractive error) and self-perception of ophthalmic health in medical students of the Centro Universitário Saúde ABC/FMABC, in the metropolitan region of São Paulo, Brazil.

Methods

This is a cross-sectional study of medical students at the Centro Universitário ABC/FMABC, carried out from July 2017 to July 2020. The study was approved by the Ethics Committee of Centro Universitário ABC/FMABC (protocol number 2.391.695) and is in line with Resolution 466/12 of the National Health Council.

Selection and Description of Participants

The sample consists of 232 medical students from the first to the fourth year, without restrictions regarding gender or age. Data was obtained through a self-administered questionnaire structured by the researcher himself, consisting of twelve dissertation questions.[11] Oral or written consent was obtained from study participants.

Administration of the questionnaire occurred during the class period. The students were identified by the following information: initials, age, sex, type of visual disorder (Myopia, Hyperopia and Astigmatism), methods of correction used, interest in refractive surgery, daily time devoted to studies, daily time spent using technology, and heredity. This study was carried out in accordance with the relevant guidelines and regulations/ethical principles of the Declaration of Helsinki.

Statistics

Descriptive statistics were used to describe and summarize the data set, presenting distributions in measures of central tendency and variability, mean, and standard deviation. Age comparison was

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performed by Kruskal-Wallis test. To assess the sample normality, the Shapiro-Wilk test was performed, and the variables were considered normal for p-value > 0.05. For qualitative variables, the absolute and relative frequency were calculated. For qualitative variables, the Chi-Square test was used. To define the sample number the GPower software version 3.1 was used. The significance level adopted was 5%. The statistical program used was Stata® version 12.

Results

Our sample consisted of 232 students, with the majority female at 157 (68%) students and the average age of the students at 22±2 years old. Among the self-declared changes were astigmatism, both hyperopia and astigmatism; myopia; and astigmatism.

The time that students spend in front of electronic devices daily deserves to be highlighted. Only 26% of students spend less than one hour in front of electronic media, with 47% between 1-5 hours, 22% between 6-11 hours, and 4% for more than eleven hours a day. (***Table 1***).

Among the sample, 173 (75%) students reported some type of ametropia and 59 (25%) reported no type of ametropia. In relation to ametropias, myopia presented a higher prevalence followed by astigmatism and hyperopia (***Table 2***). When analyzing the ametropias among the students according to the year of course, there was no statistically significant difference. In relation to age, a significant difference was observed between the years of the course, the fourth year with the highest mean age.

Table 3 shows the increase in the grade (diopters) of students throughout the medical course ($p<0.001$). There is a strong trend in the perception of worsening vision of the students during the course ($p=0.06$). Furthermore, the time spent in front of electronics daily was one of the factors that may have influenced the worsening of vision of the participants. ***Table 4*** illustrates the ophthalmological characteristics of the students with ametropias, according to the year of the course. No statistically significant difference was observed between any variables studied.

Table 1. Population Demographics.

Variable	n (%)
Sample	232 (100)
Age, mean (SD)	21.8±2.5
Sex	
Female	157 (67.67)
Male	75 (32.33)
Graduation Year	
1st Year	52 (22.41)
2nd Year	49 (21.12)
3rd Year	45 (19.40)
4th Year	86 (37.07)
Self-declared Ametropias Changes	
Astigmatism	17 (7.33)
Hyperopia	5 (2.16)
Hyperopia and Astigmatism	14 (6.03)
Myopia	62 (26.72)
Myopia and Astigmatism	75 (32.33)
None	59 (25.43)

Table 2. Distribution of the Ametropias According to Year of the Course.

Variable	1st Year	2nd Year	3rd Year	4th Year	Total	p-value
Age, mean (SD)	19.8±2.1	21.1±2.0	22.2±2.2	23.1±2.4		**<0.001****
Ametropia, n (%)						
Yes	33 (63.46)	40 (81.63)	33 (73.33)	67 (77.91)	173 (74.57)	0.16
No	19 (36.54)	9 (18.37)	12 (26.67)	19 (22.09)	59 (25.43)	
Astigmatism, n (%)						
Yes	19 (36.54)	26 (53.06)	20 (44.44)	41 (47.67)	106 (45.69)	0.39
No	33 (63.46)	23 (46.94)	25 (55.56)	45 (52.33)	126 (54.31)	
Hyperopia, n (%)						
Yes	6 (11.54)	5 (10.20)	1 (2.22)	7 (8.14)	19 (8.19)	0.37
No	46 (88.46)	44 (89.80)	44 (97.78)	79 (91.86)	213 (91.81)	
Myopia, n (%)						
Yes	26 (50.00)	31 (63.27)	28 (62.22)	52 (59.77)	137 (59.05)	0.50
No	26 (50.00)	18 (36.73)	17 (37.78)	34 (39.53)	95 (40.95)	

Legend: * Chi-square $p<0.05$; **Kruskal-Wallis $p<0.05$; SD- Standard Deviation

Discussion

This study found a high prevalence of ametropias among students. The results of the study show significant differences in relation to the grade increase reported by students since entering the course.

It was observed that 75% of the students of the Medicine course at Centro Universitário ABC/FMABC (FMABC) from the first to the fourth academic year had some ametropia, with myopia being the most recurrent in 59% of the cases. This prevalence is higher than the average of the world population, which estimates that 22% of the world population has myopia.[4]

It is believed that the highest prevalence of myopia is observed in adults in Southeast Asia.[12] A study carried out with populations of average age similar to the current one, with a sample of 15 to 25 years old, observed a prevalence of myopia of 48% in Singapore, 35% in China, and 24% in Peninsular Malaysia.[13] However, North American studies,[14] in which they obtained a database of individuals aged 18-24 years, with twelve or more years of study in their lives, found a prevalence of 43%. In a study carried out by the Department of Ophthalmology, Faculty of Medicine of Botucatu (UNESP),[15] in a population examined in the cities of the west-central region of the state of São Paulo, the prevalence of myopia was higher between the second and third decade of life (43% for men and 42% for women). The difference of prevalence seen in these studies may be associated with the evaluation method, as well as genetic factors and lifestyle habits, however all of them present lower values than those found in FMABC students.

Table 3. Student Characteristics in Relation to Health Habits and Perception According to Year of Course.

Variable	1st year	2nd year	3rd year	4th year	Total	p-value
Average hours of study, mean±SD	9.9±1.8	9.4±1.8	9.8±1.7	9.5±1.8	9.7±1.8	0.33
Frequency of ophthalmology visits, n (%)						
At least one consultation a year	25 (48.08)	28 (57.14)	28 (62.22)	57 (66.28)	138 (59.48)	0.38
Every two or more years	9 (17.31)	9 (18.37)	4 (8.89)	9 (10.47)	31 (13.36)	
When you believe it is necessary	18 (34.62)	12 (24.49)	13 (28.89)	20 (23.26)	6 (27.16)	
There's been an increase in your grade (diopters) since you went to college, n (%)						
Yes	3 (9.09)	18 (45.00)	18 (54.55)	37 (55.22)	76 (43.93)	<0.001*
No	21 (63.64)	15 (37.50)	13 (39.39)	26 (38.81)	75 (43.35)	
Does not know	9 (27.27)	7(17.50)	2 (6.06)	4 (5.97)	22 (12.72)	
Do you believe your vision has gotten worse since you went to college, n (%)						
Yes	22 (42.31)	17 (34.69)	9 (20.00)	37 (43.02)	85 (36.64)	0.07
No	29 (55.77)	32 (65.31)	36 (80.00)	46 (53.49)	143(61.64)	
Does not know	1 (1.92)	0 (0.00)	0 (0.00)	3 (1.92)	4 (1.72)	
Do you believe your eye prescription needs updating, n (%)						
Yes	9 (17.31)	9 (18.37)	6 (13.64)	22 (26.51)	46 (20.18)	0.25
No	40 (76.92)	37 (75.51)	36 (81.82)	61 (73.49)	174 (76.32)	
Does not know	3 (5.77)	3 (6.12)	2 (4.55)	0 (0.00)	8 (3.51)	
Time spent in front of the electronic media daily, n (%)						
Less than 1 hour	15 (28.85)	12 (24.49)	9 (20.00)	25 (29.07)	61 (26.29)	0.053
1h-5h	27(51.92)	19 (38.78)	19 (42.22)	45 (52.33)	110 (47.41)	
6h-10h	9 (17.31)	12 (24.49)	15 (33.33)	15 (17.44)	51 (21.98)	
11h-15h	1 (1.92)	6 (12.24)	2 (4.44)	1 (1.16)	10 (4.31)	
Daily study time, n (%)						
6h-10h	38 (73.08)	34 (69.39)	27 (60.00)	62 (72.09)	161 (69.40)	0.60
11h-15h	13 (25.00)	15 (30.61)	18 (40.00)	23 (26.74)	69 (29.74)	
Greater than or equal to 16	1 (1.92)	0 (0.00)	0 (0.00)	1 (1.16)	2 (0.86)	

Legend: * Chi-square p<0.05; **Kruskal-Wallis p<0.05; SD- Standard Deviation.

Table 4. Ophthalmological Characteristics of Students with Ametropias, According to the Year of the Course.

Variable	1st year	2nd year	3rd year	4th year	Total	p-value
Age the ametropia was diagnosed, n (%)						
1-5 years	4 (9.52)	0 (0.00)	1 (3.33)	3 (4.62)	8 (4.65)	0.26
6-10 years	6 (14.29)	9 (25.71)	4 (13.33)	8 (12.31)	27 (15.70)	
11-15 years	12 (28.57)	12 (34.29)	11 (36.67)	28 (43.08)	63 (36.63)	
16-20 years	16 (38.10)	11 (31.43)	11 (36.67)	24 (36.92)	62 (36.05)	
21-25 years	1 (2.38)	1 (2.86)	3 (10.00)	2 (3.08)	7 (4.07)	
Does not know	3 (7.14)	2 (5.71)	0 (0.00)	0 (0.00)	5 (2.91)	
Uses glasses, yes [n (%)]	38 (92.68)	34 (94.44)	24 (85.71)	61 (91.04)	157 (91.28)	0.65
No	3 (7.32)	2 (5.56)	4 (14.29)	6 (8.96)	15 (8.72)	
Uses lenses, yes [n (%)]	18 (43.90)	16 (44.44)	15 (53.57)	26 (38.81)	75 (43.60)	0.62
No	23 (56.10)	20 (55.56)	13 (46.43)	41 (61.19)	97 (56.40)	
Eye surgery, yes [n (%)]	1 (2.44)	1 (2.78)	0 (0.00)	1 (1.49)	3 (1.74)	0.83
No	40 (97.56)	35 (97.22)	28 (100.00)	66 (98.51)	169 (98.26)	
Does your father have ametropia, yes [n (%)]	39 (75.00)	39 (79.59)	36 (80.00)	71 (82.56)	185 (79.74)	0.90
No	9 (17.31)	8 (16.33)	6 (13.33)	9 (10.47)	32 (13.79)	
Does not know	4 (7.69)	2 (4.08)	3 (6.67)	6 (6.98)	15 (6.47)	
Does your mother have ametropia, yes [n (%)]	37 (71.15)	40 (81.63)	38 (84.44)	61 (70.93)	176 (75.86)	0.46
No	11 (21.15)	7 (14.29)	4 (8.89)	20 (23.26)	42 (18.10)	
Does not know	4 (7.69)	2 (7.69)	3 (6.67)	5 (5.81)	14 (6.03)	
Does your brother/sister have ametropia, yes [n (%)]	25 (48.08)	26 (53.06)	26 (57.78)	38 (57.78)	115 (49.57)	0.77
No	23 (44.23)	21 (42.86)	16 (35.56)	43 (50.00)	103 (44.40)	
Does not know	4 (7.69)	2 (4.08)	3 (6.67)	5 (5.81)	14 (6.03)	

Legend: * Chi-square p<0.05.

Although the prevalence of ametropias between school years is similar and all of them are high, the current study shows significant data regarding an increase in the grade (diopters) of students from the first to the fourth year of college. To find out the reasons for this increase in diopters in medical students at FMABC, the average time in which students studied and/or read throughout the day was analyzed.

An average study time of 10 hours was obtained, and of this, 7 hours (maximum time of their classes throughout the day) represented the period spent in the classroom. There was an association between the time dedicated to daily studies / readings and a high prevalence of myopia (in addition to the increase in the degree of myopia throughout college).

In a systematic review done in Australia,[16] young people with low time of outdoor activities and high time of use of vision for activities of approximate reading were more likely to be nearsighted. Moreover, it was found that individuals who participate in outdoor activities are more likely to have myopia. In Saudi Arabia,[17] a study regarding the presence of myopia included 504 medical students aged between 18 and 27 years (mean of 21 years), and a high prevalence of myopia was also observed among medical students.

Studies show that myopic young people tend to spend more time on computers, whether reading or writing, during periods outside the work or school environment, than non-myopic young people.[18] The use of computers and electronic averages (at 4hr/day) may be associated with a longer axial ocular length,[19] suggesting that each activity has a unique effect and different mechanism to affect myopia. An association between a higher level of education and the use of electronics (since education involves several types of close work, such as reading and using the computer) could be a factor in the development of myopia.[20,21]

With regard to heredity, the prevalence of ametropias in parents of the students in the current study was observed, with 80% of fathers having some ametropia and 76% of mothers. However, it is worth mentioning that presbyopia appears as a highlight in this absolute value, and it is not possible to analyze only the prevalence value of myopia in the parents of the participants, since the majority of students did not know what type of ametropia their parents had. Heredity is considered as the main influencing factor for the appearance of a refractive disorder.[6-8] In a study carried out in young people with one or two myopic parents, their risks were two to eight times higher of developing myopia compared to those without myopic parents.[22]

The study, by means of a self-reported questionnaire, may underestimate the prevalence of ametropias. Thus, it is possible to say that the prevalence of myopia and the increase in the diopters of medical students at FMABC could be even higher, since 20% of respondents with ametropia(s) stated that they believe that their grade needed updating. In addition, 13% of students usually go to the ophthalmologist every two or more years and 27% when they believe it is necessary.

The limitation of this study included the lack of discrimination between the Medical School years studied, given the possibility that there is a difference in exposure to reading and/or electronic equipment use between the different medical school years. Finally, we could be still apply an analysis of the optical correction method of students with ametropia, remembering that many have both contact lenses and glasses to wear on different occasions; only 2% of respondents have already had refractive surgery, which is understandable, since the minimum average age for indication of refractive surgery is twenty years (according to the First Brazilian Census on Refractive Surgery).[23]

The current study shows us a high prevalence of ametropias among medical students at FMABC, especially myopia, when compared to studies in the literature with a similar target population. There is significant data regarding an increase in the grade (diopters) of students from the first to the fourth year throughout college, in addition to a need to update their grade during the course. In the present study, it is worth mentioning the time used for daily study and reading and the abusive use of high-tech electronic devices.

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Original Article

Trends and Challenges in Rural Homeless Veterans in the United States

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Abstract

Background: Homelessness is a significant public health issue in the United States. Living in rural locations has been associated with an increase in poverty. Additionally, it has been found that veterans are at greater risk for homelessness than the general population. The aim of this research was to characterize rural homeless veterans and non-veterans living in Nebraska, United States. **Methods:** A cross-sectional study was conducted comprising 50 veterans and 64 non-veterans recruited from rural locations in Nebraska. Fully structured interviews were conducted by the research staff that consisted of questions regarding participant sociodemographics, housing, clinical characteristics, psychosocial factors, and utilization of health care and social services. **Results:** In comparison to non-veterans, rural homeless veterans were found to be older, more qualified, and more likely to have ever been married. Veterans spent fewer nights in a shelter and more nights in a halfway house. Regarding clinical features, veterans were more likely to report posttraumatic stress disorder and alcohol misuse. Veterans also reported shorter travel times to reach health care services and used them more often compared to non-veterans. **Conclusion:** These findings suggest that homeless veterans and non-veterans within rural settings have unique needs to be addressed when it comes to providing health care and social services, as well as in attempts to eliminating homelessness. Further research will help in the development of improved methods to support rural veterans and non-veterans.

Key Words: Homeless Persons; Veterans; Rural Health (Source: MeSH-NLM).

Introduction

Homelessness has long been a major public health issue in the United States (U.S.). An estimated 552,830 individuals were homeless on a single night in 2018. Approximately 65% of these individuals were sleeping in sheltered locations and 35% were in unhospitable locations, including abandoned buildings, streets, and other places unsuitable for habitation.[1] Homelessness in the U.S. is predominantly in urban areas. As a result, urban homelessness has received more attention and is more widely studied than homelessness in rural areas of the U.S. Homelessness in the rural U.S. is currently under-recognized, poorly understood, and underrepresented in the available literature, making it more difficult to understand and adequately meet the needs of this population.[2] Approximately 19% of people in the U.S. live in rural locations, which cover 97% of the country's land surface area.[3] Rural areas have disproportionally more poverty; counties with persistent poverty are overwhelmingly rural with 95% of them being non-metropolitan.[4] Rural areas have also been found to rank poorly on 21 out of 23 population health indicators with higher levels of premature mortality, morbidity, and health degrading activities such as smoking.[5-6] The uneven distribution of health care resources may contribute to these disparities in conjunction with unique cultural factors that may reinforce negative health behaviors.[7] It has been historically difficult to identify and find homeless individuals in rural areas.[2] Therefore, there has been limited data on homelessness amongst veterans living in rural areas.

There is evidence that veterans are at a greater risk for homelessness than the general population.[8] A veteran is an individual who has served in active military service and was not dishonorably discharged. In contrast, a civilian has not participated in the armed forces. There are approximately 22 million veterans living in the U.S., compared to 900,000 in the United Kingdom, 415,000 in Australia, and 220,000 in Canada.[9] Given the size of its veteran population, there has been a much greater emphasis on veteran-focused health care and research in the U.S. than in other countries. Veterans are a unique subset of the homeless population due to their military service and access to government resources not available to civilians. Despite this, veterans have been reported to have a higher incidence of mental and physical illness than non-veterans, which may increase their risk of becoming homeless.[8,10-11] Although the number of veterans who are homeless has decreased since 2009, they continue to be overrepresented in the U.S. homeless population. Veterans account for approximately 7% of the U.S. population (328 million) but represent an estimated 8.6% of the homeless adults in the U.S.[1,12] Several studies have found that homeless veterans tend to be older, Caucasian, married, and more educated when compared to non-veterans.[10-11,13-14] Previous studies also suggest that veterans are more likely than non-veterans to report alcohol abuse or dependence,[14] albeit another two large studies have reported that no such differences exist.[13,15] Moreover, there are mixed research findings available with regards to how homeless veterans and non-veterans compare when considering clinical characteristics, as well as their utilization of housing, health care, and other supportive services.[11,13-15]

It is estimated that 5.3 of the 22 million veterans in the U.S. live in rural areas.[16] Further studies on homeless veterans in the rural population can help towards the mission to end veteran homelessness in the U.S. The goal of this study was to compare homeless veterans and non-veterans in rural Nebraska on sociodemographics, housing, clinical characteristics, psychosocial factors, as well as the use of health care and social services. The objective was to compare findings from this study with those from notable studies on homelessness to reveal similarities and/or unique differences in rural homelessness persons.

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This will help elucidate any existing barriers to the mental and physical health of these understudied populations so that effective actions can be taken to better serve their needs.

Methods

Participants and Procedures

The study used a convenience sample consisting of 50 veterans and 64 non-veterans. Out of the 50 rural veterans, 39 were recruited between 2011 and 2014 by the Veterans Affairs (VA) Nebraska-Western Iowa Health Care System using flyers, referrals, and community outreach in multiple locations, including three shelters, one Veterans Health Administration (VHA) facility, one transitional housing facility, and a community center where a VHA-sponsored "Stand Down" event was held.[11] The 11 other rural veterans and all 64 of the rural non-veterans were recruited by Creighton University in 2016 via staff referrals and announcements made within homeless shelters. Inclusion criteria for an individual to participate in this study consisted of being greater than or equal to 19 years old and lacking a consistent, safe, and appropriate nighttime sheltered residence. Data was gathered by research staff who conducted structured interviews that lasted about 45-60 minutes. A $15 gift card was given to all participants. Ethical approval to conduct this study was obtained from the Institutional Review Boards of Creighton University and the VA Nebraska-Western Iowa Health Care System.

Study Sites and Descriptions

Homeless rural veterans were recruited by the VA from Nebraska micropolitan cities, namely Grand Island (n=37) and Hastings (n=2) from June 2011 to June 2014. In 2011, Grand Island had approximately 49,398 citizens and a total area of 29 square miles. A city was classified as micropolitan if it had a population of less than 50,000.[3] Grand Island's social services include a shelter and housing assistance; medical facilities include one hospital, one VHA facility, and outpatient clinics. During the sample recruitment period, Grand Island was classified as a micropolitan area but it is now defined as a metropolitan area due to an increased estimated population of 51,578 citizens in 2018.[12] Hastings covers 14 square miles and had a population of approximately 24,961 citizens in 2011.[17] Hastings has one hospital, several outpatient clinics, one shelter, housing assistance, and other supportive services.

The other homeless rural veterans and non-veterans were recruited by Creighton University from shelters in the Nebraska cities of North Platte (n=25), Kearney (n=23), and Hastings (n=27). Hastings has been previously discussed. When data were collected, North Platte had a population of 24,194 with an area of 13.9 square miles.[18] Kearney has a population of 33,021 citizens and an area of 12.77 square miles.[19] Medical facilities at both North Platte and Kearney include one hospital and outpatient facilities. There is one shelter with support services in each city.

Measures

The interview consisted of questions regarding sociodemographics (i.e. age, race, education, marital status, non-adult children, income), housing, clinical characteristics, use of health care and social services as well as psychosocial characteristics. In relation to their income, the participants were also asked if they had used any food stamps, state or local general assistance benefits, Social Security Disability (SSDI), Supplemental Security Income (SSI), SSI Drug Abuse and Alcohol (DA&A), or Temporary Assistance to Needy Families (TANF). Veterans were also asked if they had VA pension or VA service disability. Interview questions were standardized to allow responses to be coded for analysis. Previous testing of validity and reliability of individual scales that comprised the structured interview have been reported previously.[20]

Housing

To assess the living conditions, participants were asked questions on where they resided the previous night and how many years, they had been homeless in total. Transience was evaluated by asking the participants about how many cities they had lived in the past 5 years as well as how much time they had spent in their current area. They were also asked how many days that they had lived in a total of nine pre-defined settings, in the past 3 months. These settings included their own or another person's residence, a transitional site (halfway house, hotel, transitional housing, institution (prison, hospital), or actually homeless (shelter, outdoors). A 20-item scale by the Substance Abuse and Mental Health Services Administration Supported Housing Initiative was used to rate participants' satisfaction with their current living conditions.

Clinical Characteristics

To evaluate their physical health, the participants were asked a series of questions about 24 different medical conditions to comprise a medical severity score. To assess their mental health, participants self-reported substance use and mental health diagnoses. Specific to substance abuse, they were asked to self-report any alcohol or illicit drug use in the past 30 days. The Three Brief Symptom Inventory (BSI) subscales were used to measure distress relating to depression, anxiety, and psychoticism. The BSI includes 16 symptoms that are each rated on a scale from 0 to 4 (0=Never, 1=Almost never, 2=Sometimes, 3=Fairly often, 4=Very often). An observed psychotic behavior scale was also used to measure psychosis. This scale includes 10 behaviors that were evaluated based on observations of research staff during the interview. The ratings ranged from 0 to 3 (0=Not at all, 1=A little, 2=Some, 3=A lot); an average across all the ratings was also calculated to comprise the total scale score.

Psychosocial Characteristics

To measure social support, the participants identified categories of people (e.g. a spouse, adult child, parent, friend, or neighbor) who would help them in three proposed situations: transportation to an appointment, a short-term $100 loan, and someone to speak to if they were suicidal. The sum of the number of types of people ranged from 0-10. Participants were asked to rate their current quality of life from 1 to 7 (1=Terrible, 2=Unhappy, 3=Most dissatisfied, 4=Mixed, 5=Mostly satisfied, 6=Pleased, 7=Delighted).

Community integration of the participants was assessed by asking them about participation in 16 activities (e.g. visits with close friends/relatives/neighbours, visits to a grocery store) over the past 2 weeks. Number of activities ranged from 0 to 16, with higher scores demonstrating an increased community integration.

Religiosity was assessed using two items previously used in another published study on chronic homelessness.[20] Participants were asked about the importance of their religious beliefs in their lives and how helpful these beliefs have been in handling personal issues in the past 3 months. The scores ranged from 0 to 3 (0=Not at all, 1=Slightly, 2=Somewhat, 3=Extremely) and were averaged to form a total score.

Use of Healthcare and Other Services

Participants were asked if they had a physical health care provider, dental provider, mental health provider, a substance abuse treatment provider, and how much time was needed to travel to each provider. They were asked about utilization of inpatient overnight treatment, emergency room (ER) treatment, and ER or inpatient treatment for a mental health issue. Non-inpatient services were reported on, such as day hospital or program treatment, outpatient treatment, drop-in center, consumer support program services, and crisis intervention services. Related to substance use, they were asked if they had used the ER, inpatient and outpatient treatment for substance abuse; they reported on using Alcoholics Anonymous (AA), Narcotics Anonymous (NA) or another self-help group, and if they had received treatment in a residential/sober living program. Participants were asked how many months they had health insurance coverage over the past year. With regards to social service use, they were asked if they had met with someone to help with finding a job, to find housing, to help with a legal problem, and to help with public benefits or services. They were also asked if they had received educational classes or childcare services.

Data Analysis

The Chi-square and the Fisher's exact tests were used to compare survey questions by rural veteran status. Continuous variables were compared using the independent sample t-test. P-values less than 0.05 were statistically significant. Logistic regression was used to compare the odds of dichotomous outcome for rural veterans to rural non-veterans while controlling for age, gender, and education. ANCOVA models were used for continuous outcomes controlling for age, gender, and education. The Hosmer and Lemeshow goodness-of-fit statistic was calculated to assess model fit of the logistic regression models. The R-squared measure was used to assess the fit of the ANCOVA models. Non-veterans are the reference category for β coefficients. SAS software version 9.4 (SAS Institute, Cary, NC) was used for analysis.

Results

Sociodemographics

The homeless rural veteran and non-veteran groups were both majorly Caucasian. Veterans were found to be significantly older (p=0.0094). Additionally, veterans were found to have more education and were more likely to have ever been married than non-veterans. In addition, the rural non-veteran group included more female participants (31.2%, n=20) than the veteran group (4%, n=2). All participants' sociodemographic details are reported in ***Table 1*** below.

Housing

Veterans and non-veterans did not differ significantly in the total amount of time they had been homeless. Veterans were found to spend fewer nights in shelters over the past 3 months and were less likely to have been in the area they were surveyed for more than one year. Additionally, veterans stayed more nights in a halfway house or transitional housing than non-veterans. Multivariate analysis results for housing are shown in ***Table 2***. After controlling for age, gender, and years of education, statistical significance was maintained in the findings tabulated above ($p<0.01$) excluding the sole finding that veterans spent more days in transitional housing (p=0.1852).

Table 1. Sociodemographics of Rural Homeless Veterans and Non-Veterans.

Characterstics	Non-veteran (n = 64)	Veteran (n = 50)	Test of difference t or X^2 (df)	p-value
Age, mean (SD, range)	41.80 (12.06, 20-66)	48.12 (13.63, 23-91)	-2.62 (112)	0.0094
Gender			13.38 (1)	0.0003
Male	44 (68.7%)	48 (96%)		
Female	20 (31.2%)	2 (4%)		
Race			1.74 (2)	0.42
White	51 (79.6%)	43 (86.0%)		
Black	4 (6.2%)	4 (8.0%)		
Other	2 (3%)	0 (0%)		
Years of education	11.56 (2.00)	12.86 (1.63)	-3.72 (112)	0.0003
Marital status			5.15 (1)	0.023
Never married	27 (42.1%)	11 (22%)		
Ever married	37 (57.6%)	39 (78%)		
Any children under 18	16 (34.8%)	24 (38.7%)	0.17 (1)	0.68
Worked for pay in past 30 days	34 (53.1%)	21 (42%)	1.39 (1)	0.24
Ever received income from				
SSI	9 (14%)	4 (8.0%)	1.01 (1)	0.32
SSDI	9 (14.0%)	6 (12.0%)	0.10 (1)	0.75
TANF	3 (4.6%)	1 (2.0%)	0.54 (1)	0.46
Aid to family with dep. child	4 (6.2%)	5 (4.3%)	1.12 (1)	0.29
State or local assistance	4 (6.2%)	4 (8.0%)	0.12 (1)	0.72
Food stamps	43 (67.1%)	26 (52.0%)	2.33 (1)	0.13
VA pension	0 (0%)	4 (8.0%)	5.42 (1)	0.020
VA service-connected disability	0 (0%)	16 (32%)	12.34 (1)	<0.0001

Legend: SSI: Supplemental Security Income; SSDI: Social Security Disability; TANF: Temporary Assistance to Needy Families; VA: Department of Veterans Affairs.

Clinical and Psychosocial Characteristics

Clinically, a significantly greater proportion of veterans reported posttraumatic stress disorder (PTSD) (42.0%, n=21) than non-veterans (18.7%, n=12). Regarding substance misuse, the veteran group reported higher alcohol abuse or dependence and alcohol use in the past 30 days. In addition, a greater proportion of veterans were observed to exhibit psychotic behaviors during their interviews. Results of multivariate analyses for clinical and psychosocial results are reported in ***Table 2***. All of the above findings remained significant after controlling for age, gender, and education ($p<0.05$). Regarding psychosocial characteristics, the groups did not differ significantly in terms of average social support, subjective quality of life, community integration, or religiosity ($p>0.1$).

Use of Healthcare and Other Services

Veterans were found to have significantly shorter travel times to various health care providers including mental health providers and substance abuse treaters ($p<0.0001$). A larger proportion of veterans were also found to have received overnight inpatient medical treatment (26%, n=13), outpatient medical treatment (42%, n=21), and dental care (28%, n=14) in the past 3 months. For mental health treatment, a greater proportion of veterans reported using the services of a day hospital or treatment program (8%, n=4) or a drop-in center (8%, n=4). Substance abuse treatment was overwhelmingly used by veterans which included treatment through the emergency room (18%, n=9), inpatient stays (50%, n=25), as well as residential or sober living programs (38%, n=19). Results of multivariate analyses for health care and other service use can be found in ***Table 3***. After controlling for age, education, and gender, the mental health treatment findings were no longer significant ($p>0.1$), but all other group differences remained significant ($p<0.01$). No group differences were observed for other service use in the past 3 months.

Table 2. Housing, Clinical, and Psychosocial Factors of Rural Homeless Veterans and Non-Veterans.

Characteristics	Non-veteran (n = 64)	Veteran (n = 50)	Multivariate test β^ or OR* (95% CI)	Goodness of fit**	p-value
Housing					
Lifetime months homeless	4.06 (8.19)	4.66 (7.46)	-0.1016 (-0.3741, 0.1709)	0.1155	0.4615
Housing in past 3 months					
Nights in own residence	9.95 (21.55)	14.00 (25.64)	3.3279 (-7.0104, 13.6662)	0.0122	0.5247
Nights in another residence	7.36 (16.41)	15.07 (26.88)	11.1481 (1.8657, 20.4305)	0.0675	0.0191
Nights in hotel	2.41 (12.43)	5.55 (14.95)	4.6574 (-1.3144, 10.6291)	0.0457	0.125
Nights in halfway house	2.19 (9.43)	16.22 (22.96)	14.0171 (6.7554, 21.2788)	0.1676	0.0002
Nights in transitional housing	1.17 (9.38)	10.32 (26.12)	5.3214 (-2.5905, 13.2333)	0.1277	0.1852
Nights in an institution	0.77 (3.17)	2.34 (8.35)	1.7291 (-0.886, 4.3442)	0.0291	0.1927
Nights in jail or prison	5.64 (18.04)	7.42 (19.30)	3.5456 (-4.6317, 11.7229)	0.0304	0.3919
Nights in a shelter	57.45 (33.18)	17.81 (28.59)	-41.8091 (-55.5693, -28.049)	0.2969	<0.0001
Nights outdoors, abandoned building, vehicle	2.11 (6.36)	8.73 (23.55)	4.9533 (-2.0873, 11.9938)	0.0557	0.1659
Nights in another place	0.39 (2.33)	1.46 (8.06)	0.9591 (-2.3809, 4.2991)	0.0366	0.5687
Length of time in area >1 year	29 (45.31%)	7 (14.0%)	0.234 (0.084, 0.657)		0.0058
# cities lived in past 5 years	2.88 (3.45)	3.72 (4.62)	0.1726 (-1.5834, 1.9285)	0.0520	0.8459
Satisfaction - current residence	7.43 (2.25)	7.86 (1.80)	0.1638 (-0.7136, 1.0412)	0.0692	0.7121
Satisfaction - current neighborhood	8.21 (2.06)	8.06 (2.55)	-0.04029 (-1.0303, 0.9497)	0.0291	0.9359
Clinical					
Mental Health					
Schizophrenia	11 (17.1%)	5 (10.0%)	0.724 (0.199, 2.637)	0.8907	0.6241
Bipolar disorder	16 (25%)	14 (28%)	1.226 (0.467, 3.221)	0.9552	0.6786
Major depression	36 (56.2%)	24 (48.0%)	0.896 (0.38, 2.112)	0.6622	0.8011
Posttraumatic stress disorder	12 (18.7%)	21 (42.0%)	3.988 (1.405, 11.321)	0.3805	0.0094
Adjustment reaction disorder	4 (6.2%)	2 (4.0%)	0.772 (0.124, 4.804)	0.4460	0.7816
Anxiety disorder	30 (46.8%)	24 (48.0%)	1.669 (0.668, 4.173)	0.5733	0.2732
Other mental health problem	3 (4.6%)	1 (2.0%)	0.948 (0.112, 8.027)	0.8066	0.9612
Substance Abuse					
Alcohol abuse/dependence	26 (40.6%)	36 (72.0%)	2.977 (1.214, 7.301)	0.3217	0.0171
Drug abuse/dependence	27 (42.1%)	22 (44.0%)	1.333 (0.559, 3.181)	0.4802	0.5172
Days of alcohol use in past 30 days	0.95 (3.43)	3.29 (6.94)	2.3455 (0.072, 4.6191)	0.0604	0.0433
Drug use in past 30 days	54 (84.3%)	40 (80.0%)	0.732 (0.235, 2.283)	0.7345	0.5906
Medical severity score	3.63 (2.70)	4.48 (4.39)	1.3029 (-0.1541, 2.76)	0.1224	0.0791
Observed psychotic behavior	0.05 (0.10)	0.17 (0.27)	0.1251 (0.04215, 0.2081)	0.1092	0.0035
Brief Symptom Inventory	1.21 (0.73)	1.21 (0.96)	0.1521 (-0.2053, 0.5096)	0.0437	0.4007
Psychosocial					
Community integration	5.98 (2.65)	5.20 (3.14)	-0.8158 (-2.0647, 0.4331)	0.0256	0.1982
Social support	1.92 (1.21)	2.19 (1.94)	0.3039 (-0.3763, 0.984)	0.0205	0.3778
Subjective quality of life	4.54 (1.39)	4.33 (1.29)	-0.08454 (-0.6888, 0.5197)	0.0237	0.782
Religiosity	3.02 (1.14)	3.11 (1.11)	0.04321 (-0.4435, 0.5299)	0.0219	0.8607

Legend: ^ ANCOVA models with β coefficients and 95% confidence intervals corrected for age, gender, and education. Non-veterans are the reference category for β coefficients.
* Logistic regression with odds ratio (OR) and 95% confidence intervals corrected for age, gender, and education.
** R-squared values are reported for ANCOVA models. Hosmer and Lemeshow test p-values are reported for logistic regression models.

Discussion

This study aimed to compare homeless rural veterans and non-veterans on sociodemographics, housing, clinical characteristics, and psychosocial factors, as well as the utilization of health care and other services. A better understanding of these populations can elucidate ways on how to effectively improve the conditions of homeless veterans and civilians living in a rural setting. This study has concluded that both groups have many similarities, yet distinct differences were also observed between them. To summarize the key findings, (1) veterans were found to be older, more educated, and were more likely to have ever been married; (2) veterans stayed fewer nights in a shelter and more nights in a halfway house; (3) veterans were more likely to report PTSD and alcohol misuse; and (4) veterans had shorter travel times to health care services and used them more overall than the non-veterans. Multivariate analyses showed that most findings remained significant after controlling for age, gender, and education, suggesting that they are unlikely due to sociodemographic differences between groups.

The main study findings concerning sociodemographics were that homeless rural veterans were older, had more years of education, and were more likely to have been married, which is in-keeping with similar previous findings.[10-11] Three national studies have also similarly reported veterans to be older and have more educational years completed.[13-15] Two of the studies found that veterans were more likely to have been married than non-veterans.[13-14] Contrastingly, in this study, no racial differences were observed between the two groups.

Table 3. Health Care and Other Service Use of Rural Homeless Veterans and Non-Veterans.

Services	Non-veteran (n = 64)	Veteran (n = 50)	Multivariate test β^ or OR* (95% CI)	Goodness of fit**	p-value
Health service use					
Travel time to services (minutes)					
Physical health provider	45.75 (42.64)	20.87 (53.78)	-31.2748 (-51.9759, -10.5736)	0.0924	0.0034
Dental provider	87.63 (30.39)	26.02 (41.44)	-61.169 (-76.4355, -45.9025)	0.4529	<0.0001
Mental health provider	64.06 (44.12)	28.65 (43.03)	-43.6849 (-62.2695, -25.1002)	0.1906	<0.0001
Substance abuse treater	82.77 (35.15)	24.76 (40.67)	-56.0613 (-72.5107, -39.6119)	0.3768	<0.0001
Medical services, past 3 months					
ER treatment	18 (28.1%)	17 (34.0%)	2.235 (0.826, 6.052)	0.3366	0.1134
Inpatient treatment	4 (6.2%)	13 (26.0%)	7.098 (1.695, 29.726)	0.0043	0.0073
Outpatient treatment	15 (23.4%)	21 (42.0%)	2.821 (1.062, 7.49)	0.4150	0.0374
Dental treatment	4 (6.2%)	14 (28.0%)	4.631 (1.257, 17.056)	0.2802	0.0212
Mental health services, past 3 months					
ER treatment	2 (3.1%)	5 (10.0%)	2.053 (0.422, 9.98)	0.5386	0.3726
Inpatient treatment	4 (6.2%)	6 (12.0%)	1.534 (0.384, 6.126)	0.9271	0.5449
Outpatient treatment	26 (40.6%)	15 (30%)	0.635 (0.257, 1.567)	0.5650	0.3244
Day hospital or program treatment	0 (0%)	4 (8.0%)	7.08 (0.54, 92.911)	0.8989	0.1362
Drop-in center	0 (0%)	4 (8%)	6.584 (0.467, 92.898)	0.9713	0.1629
Consumer support program	0 (0%)	2 (4%)	6.533 (0.393, 108.644)	0.9652	0.1907
Substance abuse services, past 3 months					
ER treatment	0 (0%)	9 (18.0%)	55.225 (2.692, >999.999)	0.9844	0.0093
Inpatient treatment	3 (4.6%)	25 (50.0%)	15.643 (4.127, 59.292)	0.5922	<0.0001
Outpatient treatment	3 (4.6%)	7 (14.0%)	3.422 (0.728, 16.093)	0.0783	0.1194
Residential/sober living program	2 (3.1%)	19 (38.0%)	14.037 (3.157, 62.41)	0.7305	0.0005
AA, NA, or other self-help group	22 (34.3%)	26 (52.0%)	2.194 (0.895, 5.38)	0.2650	0.0858
Other service use in past 3 months					
Vocational	27 (42.1%)	19 (38.0%)	0.823 (0.343, 1.979)	0.8042	0.664
Housing	20 (31.2%)	19 (38.0%)	1.542 (0.617, 3.85)	0.7851	0.3538
Legal	10 (15.6%)	14 (28.0%)	2.474 (0.837, 7.311)	0.6629	0.1014
Help with public benefits or services	13 (20.3%)	16 (32.0%)	2.459 (0.886, 6.827)	0.1968	0.0841
Educational classes	5 (7.8%)	5 (10.0%)	2.445 (0.519, 11.517)	0.1150	0.2581
Crisis intervention services	3 (4.6%)	5 (10.0%)	1.811 (0.381, 8.614)	0.4395	0.4553
Child care services	1 (1.5%)	1 (2.0%)	2.56 (0.188, 34.903)	0.9715	0.4806

Legend: ^ ANCOVA models with β coefficients and 95% confidence intervals corrected for age, gender, and education. Non-veterans are the reference category for β coefficients.
* Logistic regression with odds ratio (OR) and 95% confidence intervals corrected for age, gender, and education.
** R-squared values are reported for ANCOVA models. Hosmer and Lemeshow test p-values are reported for logistic regression models.
ER: Emergency room; AA: Alcoholics Anonymous; NA: Narcotics Anonymous.

Regarding housing, the two groups did not significantly differ in their total amount of time being homeless. To address transience, veterans were less likely to have been in their area for more than a year. Homeless individuals have been thought of as a highly mobile population.[21] This mobility can act as a barrier to accessing health care. Yet, the homeless, veterans and non-veterans, may not be as transient as once thought to be due to conflicting evidence, which gives reason for rural areas to provide more outpatient care and programs for the homeless population.[22] Veterans in this study also reported spending more time in halfway houses. This correlates with previous findings in that homeless veterans reside in a greater number of housing types and spend more time in transitional settings.[11,20] These transitional settings can serve as a pillar of support and community. Veterans may have greater accessibility through benefits and disability to these additional housing options than non-veterans. Previous studies suggest that rural homeless individuals tend to rely on social networks for housing.[23] It is possible that homeless individuals who rely on social connections were not captured in this study's sample, since participants were interviewed in shelters.

Clinically, veterans were not reporting more physical illnesses than non-veterans which contrasts with some reports.[10,20,24] Nevertheless, differences in their mental health were noted. A greater proportion of veterans reported having PTSD, more alcohol abuse/dependence, as well as more alcohol use in the last month. The National Comorbidity Survey Replication estimated U.S. lifetime prevalence of PTSD to be 6.8%.[25] The lifetime prevalence of PTSD amongst all veterans varies based on when they served in the military but appears to be overall higher than in non-veterans.[26] Our results might be a reflection of the disproportionately higher prevalence of PTSD in veterans across the U.S. Homeless veterans in the urban setting have also reported higher rates of PTSD than non-veterans.[11] Veterans may be more likely to develop PTSD due to experiencing combat and may also be more likely to self-report PTSD due to decreasing stigma of this diagnosis.

One of the most interesting findings in this study was that veterans reported greater alcohol use, dependence, and abuse, despite utilizing more substance abuse treatment than non-veterans. Higher alcohol use in homeless veterans versus non-veterans has been previously linked.[14] Similarly, other reports have also agreed that homeless veterans exhibit higher substance use.[10,24] This higher rate of substance use is especially concerning as it can act as a barrier to exiting homelessness. On the other hand, two national studies did not find any differences in reported substance use between veterans and non-veterans.[13,15] The higher rate of substance abuse treatment in veterans might reflect their access to VA services. The Housing and Urban Development-Veterans Affairs Supported Housing (HUD-VASH) program has housed many veterans with substance misuse disorders. This program has an active case management with clinicians who are trained to provide motivational interviewing for substance misuse disorders, yet other services may need to be provided to further address these disorders. Non-veterans may have a greater barrier to accessing health care providers in the rural setting. As a result, their substance misuse disorders may be underdiagnosed or simply might be that they have less need for these services. Data supports that a "Housing First" approach that places homeless individuals directly into housing versus a multistage continuum of care approach reduces substance misuse.[27] This could be a more effective approach to treating substance misuse disorders in the rural homeless populations.

Regarding the use of health care and other services, we found that veterans used more health services overall and were in closer proximity to various health care providers. This is in line with previous evidence that homeless veterans may have greater mental health and medical needs and may use certain health services more than homeless civilians.[10,15] Also, the greater utilization of acute care services by veterans may indicate that management of their chronic health conditions or psychosocial needs was not adequate.[28] Of note, it has been found that 8.5% of veterans have reported homelessness in their adult life, yet only 17.2% of those reported using VA homeless services; additionally, veterans who were Caucasian or living in rural locations were less likely to use VA resources for the homeless.[29]

This study has several limitations which need to be addressed. First, most data were self-reported by the participants which could introduce bias into the study, and different results might have been obtained if more objective measures had been used. Second, most veterans were recruited by the VA across a wider range of recruitment settings that included VA facilities, while non-veterans were all recruited by Creighton University using staff referrals and announcements at shelters. As a result, some of the results (e.g., use of housing, access to healthcare) may reflect selection bias. Also, as participants through the VA and Creighton University were not all recruited from the same cities, we cannot rule out the possibility of sampling bias. Third, we acknowledge that the use of multiple interviewers and the difference in when data were collected by the VA and Creighton University likely increased variability in our results. Fourth, as data were collected from a small, cross-sectional sample in rural Nebraska, the findings may not be generalizable to other geographical areas. Moreover, Nebraska is 88.3% Caucasian with less racial diversity than other states.[12] Additional studies in more diverse rural areas can help clarify if significant racial differences exist between homeless veterans and civilians. Furthermore, the study sample was limited to individuals with access to shelters and may not be representative of rural homelessness in less accessible areas outside of shelters. Finally, the study sample was predominantly male, so the results may not generalize to women.

In conclusion, this study has reported on the characteristics of homeless veterans and non-veterans living in rural Nebraska. These results add further information to the available literature suggesting that these two homeless populations have unique needs. The VA has made strides tackling the needs of the veteran homeless population by greatly investing in telehealth. It has been found that health information technologies tools can support in-home care management for veterans who have been recently housed.[30] The implementation of VA Homeless Patient Aligned Care Teams (H-PACT) has also shown promising results in tailoring health care to the needs of homeless veterans.[31] Health care access among the homeless may also be enhanced through the use of web-based and mobile phone apps. Such tools can facilitate the delivery of health-related information and interventions, as well as allow individuals to record and monitor their own health data.[32] Further studies on homelessness in other rural locations in the U.S. are needed to further elucidate the barriers that these individuals are facing so that one may learn how to overcome them. Additionally, to better understand transience, surveys need to be conducted outside of shelters in rural areas.

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Original Article

Black Students' Perception of Belonging: A Focus Group Approach with Black Students at the Uniformed Services University of the Health Sciences

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Abstract

Background: Finding that enrollment of Underrepresented in Medicine students at the Uniformed Services University of the Health Sciences was considerably below the national average, researchers sought to understand the experiences of minority students. The goal is to develop an academic and social support structure that sustains and attracts students of diverse backgrounds and races. **Methods:** Individual interviews of eight matriculated Black medical students and a focus group were conducted, with Institutional Review Board approval, to obtain feasible methodologies and implement change. Student's perspectives and experiences regarding their institution were investigated using qualitative thematic analysis. **Results:** The analysis revealed six themes from the individual interviews: Experience as a minority; Admission process; Difference in backgrounds; Curriculum culture; Diversity at the school; Military medicine. The overarching message from the students was "If you don't see yourself represented somewhere, it's hard to believe that you belong." The focus group made four recommendations: Add a minority viewpoint to curriculum; Add textbooks that portray black skin; Collaborate with Historically Black Colleges and Universities; Increase recruitment of Black students and faculty. **Conclusion**: It is hard for minority students to believe they belong in environments without the representation and infrastructure needed to support their unique needs. Implementing ideas, such as those described in this report, is an important step towards creating inclusion and equity.

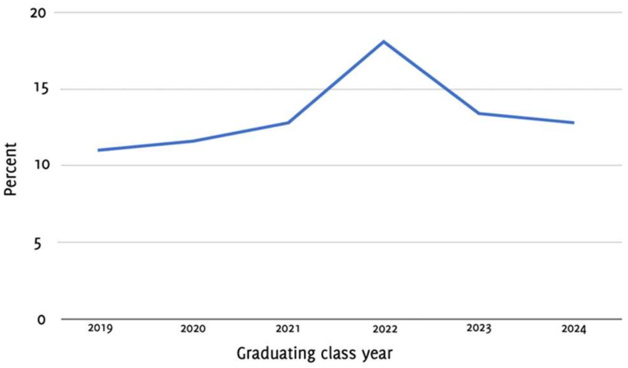
Key Words: Medical students; Qualitative Research; Minority Groups; Undergraduate Medical Education; Social Perception (Source: MeSH-NLM).

Introduction

Under-represented in medicine (URM) groups are defined as racial and ethnic populations that are underrepresented in the medical profession relative to their numbers in the general population. According to the American Association of Medical Colleges, URM are: "Black/African American, Native American (American Indian, Alaskan Native or Native Hawaiian), Mexican American, and Mainland Puerto Rican".[1] URMs represent approximately 22% of students matriculating to allopathic medical schools across the nation.[2] The F. Edward Hebert School of Medicine, Uniformed Services University (USU), lags behind its peers with a URM enrollment of 13.4%. ***Figure 1*** shows little change in the percentage of URMs matriculating to USU over the past six years. Research has shown that Black students at predominantly white medical schools experience more stress than white students due to the perceived inadequacy of their academic preparation, poor interactions with faculty and classmates, lack of role models, environments insensitive to their cultural backgrounds, and implicit bias or racism.[3-7]

An extensive literature review shows a significant gap regarding first-hand accounts of the Black medical student experience, other than as depicted by Hadinger in 2017 where the URM perspective of the medical school admissions process was researched.[8] Prior assessments of URM experiences were based on quantitative data, such as the 1980's study of Black medical students in North Carolina who identified their perceptions of their learning environment via a questionnaire.[5] The lack of in-depth first-hand accounts of URM medical students led to our question: What are the experiences of URM students at USU? What can be done to mitigate negative experiences?

Figure 1. Percentage of URM at USU.



Methods

After Institutional Review Board approval, a recruitment email was sent to the 23 members of USU's Student National Medical Association (SNMA) chapter with eight responses (35% participation). Respondents all identified as Black, included male and female genders, and represented all four years of medical school. With consent from each

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participant, we conducted and recorded "virtual" interviews of individuals then subsequently, with a focus group. Interview and focus group questions are outlined in ***Table 1***.

Table 1. Interview and Focus group Questions

Individual Interview Questions	Focus group questions
What is your definition of diversity? Are you satisfied with the diversity of your school?	What are your thoughts on how the current curriculum addresses cultural sensitivity/awareness?
How would you describe your experience as a minority student at USU in your interactions with faculty and students? Can you tell me more about that?	What thoughts and/or recommendations do you have to help increase cultural sensitivity/awareness in the curriculum?
How would you describe your experience as a minority student at USU with regards to the curriculum and your learning environment? Have you experienced racial bias? In what way?	What resources do you feel the university has to support you as a URM? Support in what way?
How has your experience as a minority student at USU impacted your academic performance? Overall well being/morale?decision to pursue medicine? Military medicine?	Which of the resources have you found helpful? What would you like to see implemented that would help support more students like you?
Would you say your experience in medical school as a URM is similar or different than that of your peers at USU? Explain.	What ideas do you have to increase recruitment in URM in medicine? USU or Health Professional Scholarship Program?

Individual Interviews

One co-investigator (MJ), herself a Black woman medical student at USU, interviewed the 8 participants individually. There was an atmosphere of trust, shared language, and shared experiences. Trust allowed the students to speak candidly about issues they had previously kept private. The recorded interviews were transcribed by a professional transcription agency. MJ de-identified the interviews prior to sharing them with the other two investigators. Two co-investigators completed the analysis using thematic qualitative analysis.[9,10] They independently used line-by-line coding with constant comparison. As they proceeded, the co-investigators discussed each line and code until coming to an agreement. They independently arranged the codes into themes and discussed the themes and their descriptions and implications until achieving consensus. NVivo 12 © (www.qrsinternational.com) was used to manage the data.

Focus Group

The focus group (seven of the eight students) was conducted by a second Black female faculty member (WS) in coordination with the medical student (MJ). Students were not deceived but were generally not aware of VR's presence (a White female faculty member) at the video meeting as her camera was not on. The questions were discussed candidly. The trust that was established in the interviews quickly became apparent in the focus group interactions. Consensus was established as the group discussed the themes one-by-one and found their experiences, opinions, and recommendations were nearly identical.

After a review of the focus group discussion, the authors proposed additional recommendations.

Results

Individual Interviews

The analysis revealed six themes which are provided with samples of direct quotes from the interviews. ***Table 2*** lists additional student quotations.

- Experience as minority: *"The only time we see [like] black people is [like] the people who are serving us lunch or [like] people who are [like] janitorial service." (sic)*

URM students experience intense imposter syndrome[11] which does not abate. Imposter syndrome, while ubiquitous in students in higher education, is especially problematic among URM students, who often experience race-based imposter syndrome. Evidence of tokenism combines with low self-esteem to create an emotionally stressful situation in which URM students struggle, not because of academic difficulty, but because of being the only person of color in the classroom.

Minority students have difficulty relating to faculty, peers, as well as the Office of Student Affairs because of a lack of minority representation in areas that have been designated as "support" areas. Students are afraid to ask for help for fear of being labled *"dumb"* among classmates and faculty. Most have trouble adapting to USU's social life and are isolated. They feel out of place in the educational environment and feel the need to "code switch" (not use "Black English"; use only Standard English). They feel they must put on a fake persona to come to campus, which makes the experience emotionally draining and depressing. They do not feel the camaraderie that is displayed among their classmates and feel they must be overly cautious of how their words could be perceived. This theme was mentioned in seven of the eight interviews.

- Admissions process: *"I only got in because, you know, they were looking for a quota." (sic)*

Seven of the eight students believe they were accepted to USU solely to fill a quota instead of having been selected based on merit. This was perpetuated when students shared examples of constantly being called the wrong name by peers and faculty or mistaken for *"other Black people."*

- Difference in backgrounds: *"my interest lies more in those populations that have to deal with food deserts or who go to disadvantaged homes or who systematically grow up with fear of physicians." (sic)*

Students highlighted the differences in their backgrounds, including not coming from prestigious schools, wealthy communities, or having affluent parents. Prior to attending medical school, URM students did not have similar resources such as tutors and role models as their non-minority peers. This theme was mentioned in six of eight interviews.

- Curriculum culture**:** *"we need a curriculum, we need textbooks, we need lecture materials that identify African-American skin...because that's what we're treating. We're not just gonna have a white patient all the same all the time." (sic)*

Students believe there is a racial bias in the curriculum. All students remarked that the race of most of the patients - either on written exams or patient interactions - was White and the way certain conditions looked on non-White races was only noted if someone specifically asked. Students felt that in the small group settings – where sensitive topics such as race were being discussed – the use of cookie-cutter answers often did not allow for open and honest discussion. This theme was mentioned in seven of eight interviews.

- Diversity at USU: *"It's hard to think that a school cares about you if they don't have many of you in the school" (sic)*

All eight students are dissatisfied with the diversity at USU regarding minority representation in both the pre-clerkship and clerkship curriculum.

- Military medicine: *“my decision to continue to pursue military medicine is definitely brought about hesitancy” (sic)*

Students express differences in their decision to pursue military medicine and the impact their USU experience made. Three students felt there was commonality because the military is a community that takes care of each other, while five felt the military was a vehicle for them to gain training then return to serve in their communities.

Table 2. Additional quotes from the individual interview, along with their respective themes.

Theme	**Quotes (sic)**
Experience as a minority	• “**I come on campus and I don't see anybody that looks like me**, maybe like one or two days a week, if I'm like on campus” • “there's just such a small number of minorities in medical school, especially our medical school… I don't know. I just think all of that stuff **weighs on you**, even if it's subconsciously,” • “the way the email was worded made me think that I was being told I failed like the entirety of the class. So I remember that day I was like depressed and I was in school and I couldn't talk to anyone. **I was about to cry.** And like, I just remember like the entire day hurt, my heart. And then I opened the whole e-mail. And I was just like, why would it tell me like this? And **it turned out someone thought I was someone else again.** And emailed me.” • “my experience in the beginning was a bit difficult because of **getting called the wrong name a lot** ” • “any time I had had multiple Black people in my group. I've been **called one of the other black people multiple times.**” • “it's a little bit **insulting** just because, like, it means that the repertoire that we build, we're not actually building it. You're kind of **packaging other black people** and you're like, oh, yeah, black people.” • **“you're minimizing by my existence,** you know, and the work that I put, you know, is like well...not only did my existence get minimized but the **person who I got confused with got minimized, too.**”
Admissions process	• “Do something great. **Like we got into medical school. But. You can still feel like we didn't really deserve it.** … my MCAT score wasn't that high I know.” • “increasing diversity isn't just allowing more people in, but you have to have the infrastructure in place.” • “Because part of my opinion that part of increasing **diversity isn't just allowing more people in, but you have to have the infrastructure in place**”. • “So I think part of the **exception that they made for me** was because I'm diverse and I'm like considered a minority in many different ways. Looking back, I think **that hurt me more than anything.**” • **“And so this significantly impacted my mental health and my wellbeing and constantly in the back of my head. I was just thinking to myself. Was I truly qualified or did they just want to like kind of kind of fill a quota”**
Difference in Backgrounds	• “I'm interested in minority health issues in that personally, as one of the rubs that I have with military medicine is because our constituents, our future constituents, **they don't deal with the same things that minority**, typical minority populations do… for me” • “it was hard for me to reach out to other students, to other students for help just because of that feeling of wanting of **not wanting to be a burden on everyone else** who's in the middle of studying for the same tests that you are and **they're not struggling**.” • “not really wanting to speak up and in certain conversations that are being had, because **I don't feel like my voice will be heard** because I guess that I have a different set of experiences, I think a little bit differently than everyone else.”
Curriculum culture	• “I'm the one Black person and **everyone's looking at me to like provide my black views on it.** And sometimes that's hard. I don't know.” • “I've had **multiple questions** where there was nothing really to say that was sickle cell except for African-American.” • “I do think that there's times like during small groups that I don't feel like. **I don't feel confident enough to speak up because I think a little bit differently than everyone**” • “it's not our job. **We already have a stressful curriculum itself** and I'm not going to sit there, and spend time teaching each one of these kids what it's like, to grow up without access to food and how food deserts work?”
Diversity at USU	• “we would not be able to pull ourselves **up by the bootstraps if we don't get no boot straps.**” • “I feel like **if I were maybe not a minority, I would have more access to resources** that people feel free to share that kind of stuff.” • “**I wish there were more minority students at our medical school,** because I think that obviously from being a minority and being around others that share your common experiences, that can be helpful, almost like another support network. Instead of **always trying to feel like you have to play two sides of the same coin and maybe not be your authentic self because you're constantly being judged** or, you know, feel like you have to act a certain way.” • “it's just like stress I didn't ask for.”
Military medicine	• “… like my first and second year made me start to question like, why am I even doing this? Like the whole purpose of people signing up to not just be in the military but also be a **healthcare provider in the military is like a huge sacrifice in itself and the sacrifice for the people that you're also serving. And if they don't appreciate it. Then it's just like, why am I even wasting my time?”** • “but if things continue the way they are, we're **not really going to see changes**” • **“I think a big issue of not having diversity, is if People don't know you as a person and they refuse to know you as the person. I'm not going to be able to get nowhere”**

Focus Group Recommendations

Seven interviewees met with two researchers for additional discussions and provided recommendations to improve the USU learning environment. Their suggestions include updating the curriculum along with textbooks and resources, adding a minority viewpoint. Students feel it is important for educational material to reflect the diverse patient population, such as having textbooks that show how dermatologic conditions present on other than White skin. The focus group feels increasing recruitment of faculty, staff, as well as students must be a priority as USU is lacking Black faculty and staff. Students mentioned that the only resource available to support their URM-specific needs was the counseling center, but they were hesitant to visit the center because of the perceived lack of representation of minority counselors. In the interim, the focus group recommends USU collaborate with local Historically Black Colleges and Universities (HBCU) to obtain advice/assistance on issues related to diversity and cultural competency.

Discussion

"If you don't see yourself represented somewhere it's hard to believe that you belong" was alluded to by all participants and summarizes the themes found. Students need to see themselves represented among their peers, faculty, and curriculum. Unfortunately, the perceived lack of diversity in these areas manifested as feelings of tokenism. These URMs attending USU experience minority-specific imposter syndrome and perceived racial bias in the curriculum. They feel lonely and out of place, with limited connection to their non-minority peers, based on their goals to serve in underrepresented communities. These sentiments led to the recommendations from the focus group which embody their need: to feel welcome in their learning environment, create a similar environment for other URM, and for their peers and faculty to be aware of their perceptions of isolation and being unwelcome.

Researchers' Recommendations

The researchers provided five additional recommendations based on their subject-matter expertise and engagement in previous programs. First - URM students require a program that provides academic and social support. Second - faculty/student-led forums surrounding issues of race and racism, followed by action, must continue. Third - design a Racism in Medicine course. Fourth - expand mentorship opportunities for pre-medical audiences. Fifth - design a pipeline program for pre-medical students who have potential but do not meet USU's admission requirements.

Integrating a minority viewpoint to the curriculum and adding texts and resources that demonstrate the minority experience can increase the likelihood of improved relationships and later patient–physician concordance.[12-16] Collaboration with local HBCUs and increased recruitment of Black students, faculty, and staff will provide students more sense of belonging and contribute to the critical mass that is needed to make meaningful change.[17,18] Programs, such as the medical school pipelines at Wayne State University as well as Southern Illinois University Schools of Medicine, have been successful in matriculating and supporting diverse students.[19,20] A cascading mentorship program can promote an inclusive climate by providing academic and social support to students at different levels of education and from a variety of backgrounds.[21,22] These interactions highlight the significant roles medical school personnel have as role models in helping to diversify the medical profession.[23]

USU is not unique among U.S. medical schools that are struggling to recruit and retain a diverse student body. Medical school leaders across the nation are developing and implementing innovative solutions to this challenge.[17-22] With the transition to a virtual era during the pandemic, collaborating with other schools is more accessible than ever. Collaborations could start by simply having guest facilitators moderate/teach a Zoom (distance learning) class from anywhere in the world. Thus, this study's results are certainly generalizable to other medical and graduate schools that face similar challenges.

Limitations

This study was conducted at a military medical school - the only one of its kind in the U.S. The experiences and feelings of the participants that responded may be different from the general population of medical students in the US. Self-selection could have created a population of participants whose opinions and experiences differed from other SNMA members who did not participate. Further comparative research to evaluate students' perspectives, to include comparative sampling, would be useful.

Conclusion

It is difficult for minority students to believe they belong in an environment without the representation and infrastructure needed to support their specific needs. Students experience intense imposter syndrome, feel lonely, out of place, exhausted by the "minority tax" and "don't know how to navigate the system and don't feel welcome."[24] Implementing programs and ideas like those found in this report will be a step towards creating inclusion and equity.

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Original Article

Improving Medical School Education on the Care of Sexual Assault Patients: A Quasi-Randomized Controlled Study

Katherine Hoopes,[1] Tessa Lewitt,[1] Anum Naseem,[2] Anne Messman,[3] Sarkis Kouyoumjian.[4]

Abstract

Introduction: Comprehensive healthcare for survivors of sexual violence is essential to prevent the diverse sequelae associated with the assault. In partnership with a local rape crisis center, we designed an educational module with the goal of training medical students on the basic needs of sexual assault patients with the aim to see if there was a significant difference in preparedness to counsel such patients. **Methods**: This quantitative quasi-randomized controlled study tested the effectiveness of an educational module on improving medical student preparedness for encounters with victims of sexual assault. A one-hour presentation, focusing on basic medical and legal knowledge regarding sexual abuse and compassionate patient-centered care, was provided to the intervention group during their compulsory Year 4 Emergency Medicine clerkship orientation. At the end of the month, students in the intervention and control groups were assessed using a standardized patient encounter simulating the presentation of a victim of sexual assault. Scores were determined by standardized patients, who utilized two checklists – one widely used for communication skills (KEECC-A) and the other focusing on sexual assault (WC-SAFE-specific). **Results:** For the KEECC-A, there was no significant difference in scores between the control and intervention groups (p=0.9257, 95% Confidence Interval [95%CI] 14.42,15.58). The WC-SAFE-specific checklists were significantly different between the intervention and control groups (p=0.0076, 95%CI 3.79,4.21). **Conclusion:** Our sexual assault module increased preparedness of medical students for encounters with sexual assault victims and provide trauma-informed care.

Key Words: Counseling; Rape; Survivors; Sex Offenses; Crime Victims; Comprehensive Health Care (Source: MeSH-NLM).

Introduction

Over 323,000 reports of sexual assault were reported in the United States in 2016 alone, and were experienced by one in six women and one in 33 men.[1] These statistics largely underestimate the total number of rapes as the Rape, Abuse, and Incest National Network estimates that just one in three victims of rape report the assault.[2] The term "sexual assault" is defined as any nonconsensual sexual act, including when the victim does not have the capacity to consent.[3] The population economic burden of sexual assault in the United States is estimated to be about $3.1 trillion, underscoring the significant public health burden of this crime.[4]

Sexual violence is a public health crisis, with an estimated 23 million women in the United States reporting an attempted or completed rape during their lifetime.[5] As a result, most medical providers will encounter victims of sexual assault during their clinical careers. These interactions can have long-standing impacts on health outcomes.[6] Several medical associations, including the American College of Obstetricians and Gynecologists, the American Psychiatric Association, and the American Academy of Pediatrics describe duties of physicians in providing care to patients who are survivors of sexual assault, thus making our results pertinent to the training of future physicians.[7]

Comprehensive healthcare services for survivors of sexual assault are essential, and survivors should seek emergency medical care as soon as possible to manage the diverse sequelae of sexual assault. These include both short- and long-term physical and mental trauma, sexually transmitted infections (STIs), and unintended pregnancy. Furthermore, a visit within 72-120 hours after assault is the most optimal time to provide medical care for these patients, which often includes the services of an emergency physician (EP) and a sexual assault forensic nurse examiner.[8]

It is imperative that medical students recognize relevance and value of sexual assault education in their training. Such training for medical students is necessary, as many have never had formal training with regard to appropriate interventions for victims of sexual assault.[5] For example, although EPs are most often the initial medical providers treating victims of violent crimes, many are not adequately trained to care for sexual assault patients as there is currently no standard forensic medical training program.[9,10] Thus, the aim of this study was to design and assess an educational module, with the goal of increasing the preparedness of medical students for encounters with sexual assault victims.

Methods

Educational Module

This quantitative quasi-randomized controlled study tested the effectiveness of an educational module on improving medical student preparedness for encounters with victims of sexual assault. Our educational module was designed by a team from Wayne County Sexual Assault Forensic Examiners (WC-SAFE), a local non-profit organization that provides free emergent and ongoing comprehensive medical, legal, and psychosocial care to sexual assault patients in our community. The

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team consisted of the Director of Crisis Services and Outreach and sexual assault nurse examiners.

A one-hour PowerPoint lecture was given live by the WC-SAFE Director of Crisis Services and Outreach to medical students during their compulsory Year 4 Emergency Medicine (EM) clerkship orientation. The PowerPoint presentation was given during the first week of the 4-week EM rotation. The presentation consisted of three sections (Supplementary Material 1).

1. The first section focused on our local community, including the hospital systems and clinic sites where WC-SAFE provides forensic medical exams (FMEs) and counseling services. The lecture provides phone numbers (including the crisis pager phone number), website information, and contact persons to answer further questions about WC-SAFE.

2. The second section discussed logistics of the FME, described the basic legal ramifications of sexual assault, and outlined the resources that should be offered to patients. As presented in the PowerPoint, the FME involves EPs, law enforcement, and advocacy crisis hotlines. Patients must meet requirements and approve for the exam to be completed. Written consent must be obtained except in situations of intoxication, cognitive impairment, or medical sedation. Additional essential information includes: documentation of the patient's medical and assault history; assessment, written and photographic documentation; coordinated treatment of any injuries; and collection of forensic evidence and toxicology specimens. Treatment and follow-up referrals for pregnancy prevention, STI and Human Immunodeficiency Virus prophylaxis, and other non-acute medical conditions should be provided. Ongoing advocacy services should be offered for future care after resolution of acute medical issues.

3. The final section centered around the neurobiology of trauma. In addition to defining trauma and trauma-informed care, this portion of the presentation described a range of responses a patient might experience after the trauma of a sexual assault.

In addition, a two-page brochure including the WC-SAFE mission statement, clinic sites, phone numbers, services overview, and survivor testimonials was provided to students (Supplementary Material 2).

Randomization

Our investigation occurred from June 2019 to January 2020. All medical students completing their compulsory Year 4 EM clerkship were included in the study except for those in December 2019 due to low enrollment. Students were assigned to either the "control" or "intervention" group based on the month they completed their EM clerkship. Students enrolled in July, August, and January (n=71 students) received the educational module during their orientation. Students enrolled in June, September, October, and November did not receive the educational module (n=76 students). This study was exempted by the Wayne State University School of Medicine Institutional Review Board.

Objective Structured Clinical Examination (OSCE) Administration

Student performance was evaluated as a component of the EM clerkship final examination. Students in both groups completed an OSCE during which one of the standardized patients (SPs) portrayed the role of a fictional sexual assault victim ("Samantha Adams"). This case was modified from an existing OSCE case about domestic violence.

Six female SPs were trained with specific instructions and guidelines to embody Samantha Adams' presentation to the Emergency Department (Supplementary Material 3). The instruction included Samantha's demographic information, mood, clothing on presentation, employment, and details of her home life. In addition, SPs were provided a history of presenting illness and an opening statement.

OSCE Scoring

Students' OSCE performances were scored by the six SPs using a combination of two checklists. The first was the adapted Kalamazoo Essential Elements Communications Checklist (KEECC-A), which utilizes seven elements of critical importance of communication between the physician and patient. (Supplementary Materials 4).[11,12]

The second checklist utilized was specific to sexual assault and trauma-informed care (Supplementary Material 5). It was designed in conjunction with WC-SAFE to test students' knowledge of the most essential elements of the physician-patient interaction acutely following a sexual assault. It was composed by the investigators of this project and several WC-SAFE employees involved with education and outreach. The checklist was content validated by the director of the clinical skills program at our institution, as well as by the SPs. All feedback was taken into consideration before its finalization and implementation.

Included on this checklist were the following six critical actions: 1) student knows to call the WC-SAFE crisis hotline; 2) student knows that a certified professional will perform the FME; 3) student mentions the time-sensitivity of the FME; 4) student informs the patient that it is not necessary to complete the FME or to press charges; 5) student offers counseling and resources; and 6) student shows concern for patient safety upon discharge. One point was awarded for each critical action met, with scores ranging from 0-5 points.

Results of both checklists were statistically analyzed using p-values reported for the Wilcoxon Rank Sum t-Test Approximation. A p-value <0.05 was considered significant.

Post-OSCE Survey

Following the OSCE, students were sent a four-question survey using SurveyMonkey (San Mateo, CA) online survey software. The survey asked for:

1. Student identification number (not required for participation),

2. Number of WC-SAFE lectures students had received prior to their EM rotation (required),

3. Past personal experience working with victims of sexual assault (required),

4. Feedback about the experience (required).

Results

Of the 147 students who completed the OSCE, 76 students were in the control group (51.7%) and 71 students were in the intervention group (48.3%). 93 students completed the post-OSCE survey (response rate=63.27%). Eleven chose to exclude their student identification number (functional response rate=55.78%). ***Figure 1*** shows the trial Consolidated Standards of Reporting Trials (CONSORT) flowchart. The control and intervention groups did not differ significantly with respect to either prior experience either with WC-SAFE lectures or working with victims of sexual assault (p=0.647) nor did they differ significantly with regards to gender (p=0.052) (***Table 1***).

Table 3 displays the groupwise comparison of evaluation measures between the control and intervention groups using the Wilcoxon Rank Sum t-Test approximation. Regarding the KEECC-A, which had a total score of 25, there was no significant difference in scores between the control and intervention groups (p=0.9257, 95% CI [14.42, 15.58]). Mean score was 14.9±4.1 in the control group, and 15.1±3 in the intervention group

By contrast, scores for the WC-SAFE-specific checklist were significantly different between the intervention and control groups (p=0.0076, 95% CI [3.79, 4.21]). Mean score was 3.8±1.3 for the control group and 4.3±1.2 for the intervention group. Thus, SP evaluations of students using the validated KEECC-A showed no significant difference in communication and patient care skills between the control and intervention groups (p=0.926), while SP evaluations of the WC-SAFE specific checklist did result in a statistically significant difference (p=0.009).

Figure 1. CONSORT 2010 flowchart.

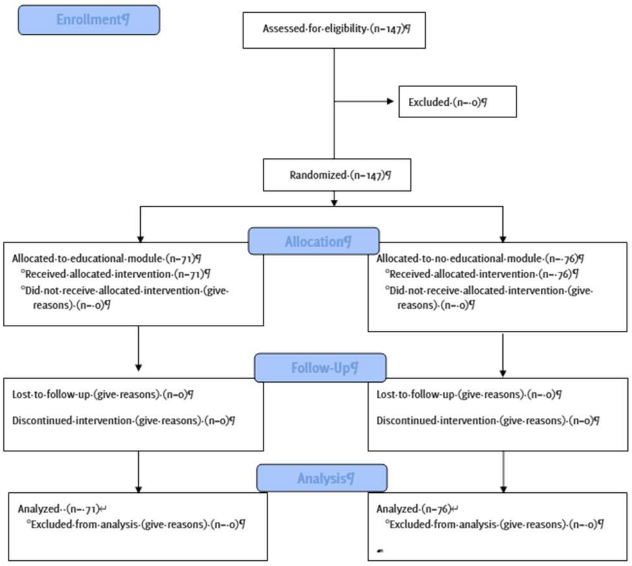

Table 1. Experience and Gender Distributions by Student Group

Characteristic	Total	Control n (%)	Experimental n (%)	p-value
Experience				
No prior lectures or sexual assault experience	106	54 (50.94)	52 (49.06)	0.65
One or more lectures and/or sexual assault experience(s)	38	21 (55.26)	17 (44.74)	
Gender				
Female	59	25 (42.37)	34 (57.63)	0.05
Male	85	50 (58.82)	35 (41.18)	

Discussion

Our findings suggest that while students in both the control and intervention groups from our institution are similarly prepared to communicate with patients, those in the intervention group were better prepared to evaluate and treat victims of sexual assault who present acutely to the ED.

Our module provides specific content to provide medical student or residents with effective training to increase their capacity in counseling and providing compassionate care to sexual assault patients. For example, although the American Board of EM's Model of Clinical Practice includes sexual assault patient assessment and examination, as necessary topics and skills, there is a lack of recommendations for specific content needed to provide resident training.[9] It is plausible that lack of formal training could decrease compliance with recommended protocols, including pregnancy, STI prophylaxis and psychological referrals.

Though we worked closely with our community-based sexual assault response organization to create our module, this educational module can be easily reproduced in medical school curricula throughout the United States. In fact, 76 of the 131 medical schools participating in the Association of American Medical Colleges (AAMC) 2018-2019 Curriculum Inventory utilized OSCEs in their Academic Level 3 clerkships.[13]

Standardized sexual assault-focused education and clinical reenactment is lacking in most medical school curricula.[14] Other studies assessing medical student understanding and application of trauma-informed care for survivors of sexual assault are limited; most are comprised of educational videos followed by a survey assessment. One study at Boston University School of Medicine provided an informational video on initial medical management, a simulated patient interview, and audio of additional interviews, in addition to a pre- and post-module questionnaire.[15] Another study involved a two-hour lecture, a training DVD, and questionnaire.[6] Though students' scores were significantly higher on the post-module questionnaires in both studies, these studies were limited by lack of information application.[6,13]

Thus, although previous studies have been successful in teaching students about sexual assault and its sequelae, our educational module is unique in that it includes an OSCE to allow students to apply their knowledge and compassion to a simulated SP encounter. This provides an unmatched opportunity for students to prepare for future interactions with victims of sexual assault and to better understand trauma-informed care.

The data shows that students in the control and intervention groups were comparable in terms of sex and prior experiences with sexual assault education. However, other possible confounding variables like age, academic performance, or socioeconomic status were not assessed. It was also not assessed whether the OSCE was triggering or in any way impactful for the standardized patients. The discrepancy of standardized patients and sexual assault victims also must be noted. The standardized patients portrayed one form of response while in reality there is a diverse array of reaction a victim may have to an assault. Furthermore, the participants were quasi-randomized based on month of their EM clerkship, which may impact the validity of our results. The longitudinal impact of the educational module on the two control groups is also needed to substantiate our results.

Our checklist was created by experts in the field of sexual assault education and reviewed by members of our institutions' clinical skills team, however it was not piloted. In addition, power analysis for statistical significance prior to the start of the study was not completed.

The integrative team of this study plans to incorporate our educational module and OSCE into the curriculum of other nearby medical schools. We hope to make variations in future modules to improve the learning experience for medical students. For example, including a victim's advocate, forensic nurse and a physician who cares for these patients to deliver the module might make it more targeted for medical students. Providing local resources and a framework to approach patients is also important to include to encourage this education module to be used at medical schools where a local rape crisis center is not accessible.

Furthermore, as sexual assault survivors are a heterogenous group (especially in terms of their recovery needs), this curriculum may also be tailored to specific patient populations including black, Hispanic, lesbian, gay, transgender, bisexual, queer, and gender-nonconforming.

The significant difference between the two groups of students in counseling the SPs demonstrates our educational module can improve the preparedness of medical students for future encounters with sexual assault survivors. The PowerPoint presentation and OSCE assessment provides a simple and valuable approach to educate students and evaluate their interactions with victims of sexual assault.

Table 3. Groupwise Comparison of Evaluation Measures.

Checklist	All (n=147)		Control (n=76)		Experimental (n=71)	
	Mean (SD)	Median (Q1, Q3)	Mean (SD)	Median (Q1, Q3)	Mean (SD)	Median (Q1, Q3)
WC-SAFE	4 (1.3)	4 (3, 5)	3.8 (1.3)	4 (3, 5)	4.3 (1.2)	4 (4, 5)
m-KEECC	15 (3.6)	15 (12, 18)	14.9 (4.1)	14.5 (12, 19)	15.1 (3)	16 (13, 17)

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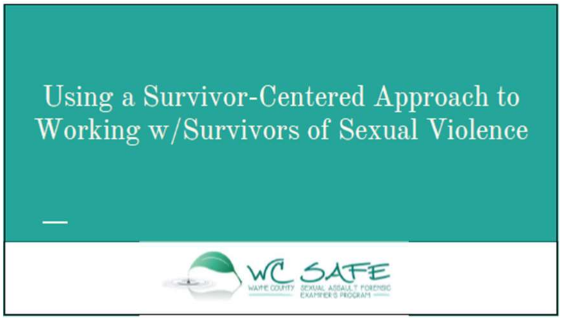
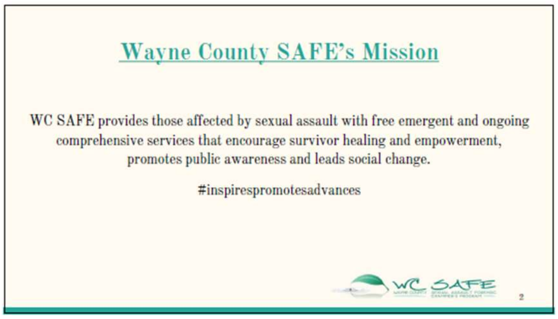
Supplementary Material 1

Title: Powerpoint presented to medical students.



Using a Survivor-Centered Approach to Working w/Survivors of Sexual Violence



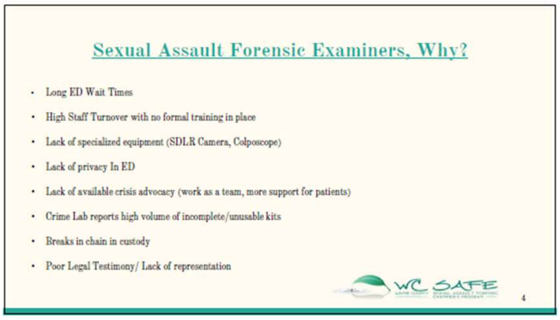
Wayne County SAFE's Mission

WC SAFE provides those affected by sexual assault with free emergent and ongoing comprehensive services that encourage survivor healing and empowerment, promotes public awareness and leads social change.

#inspirespromotesadvances

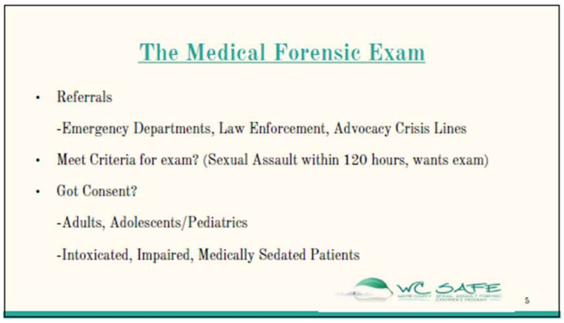
Wayne County SAFE

- Over 1,000 patients per year, numbers growing since 2006
- 313-430-8000 Pager System answered by on-call SAFE available to provide services 24/7, 365 days a year, SAFE and advocacy team
- 5 Clinic Sites
- Hospital System Partnerships
- Inpatient Exams



Sexual Assault Forensic Examiners, Why?

- Long ED Wait Times
- High Staff Turnover with no formal training in place
- Lack of specialized equipment (SDLR Camera, Colposcope)
- Lack of privacy In ED
- Lack of available crisis advocacy (work as a team, more support for patients)
- Crime Lab reports high volume of incomplete/unusable kits
- Breaks in chain in custody
- Poor Legal Testimony/ Lack of representation



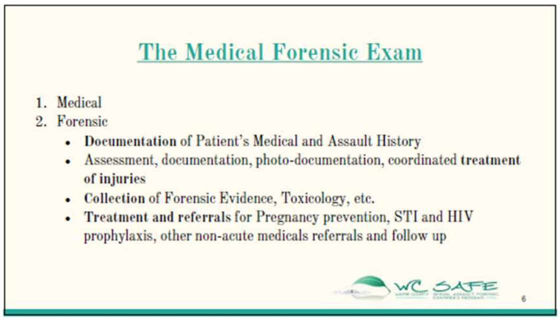
The Medical Forensic Exam

- Referrals

  -Emergency Departments, Law Enforcement, Advocacy Crisis Lines
- Meet Criteria for exam? (Sexual Assault within 120 hours, wants exam)
- Got Consent?

  -Adults, Adolescents/Pediatrics

  -Intoxicated, Impaired, Medically Sedated Patients



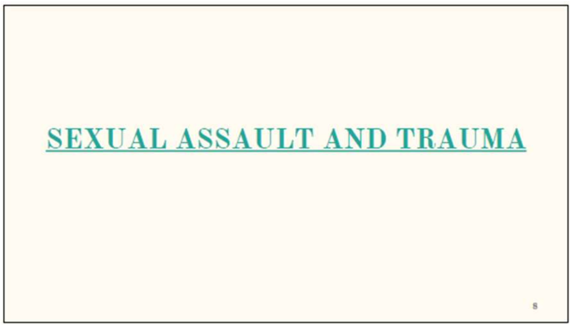
The Medical Forensic Exam

1. Medical
2. Forensic
   - **Documentation** of Patient's Medical and Assault History
   - Assessment, documentation, photo-documentation, coordinated **treatment of injuries**
   - **Collection** of Forensic Evidence, Toxicology, etc.
   - **Treatment and referrals** for Pregnancy prevention, STI and HIV prophylaxis, other non-acute medicals referrals and follow up

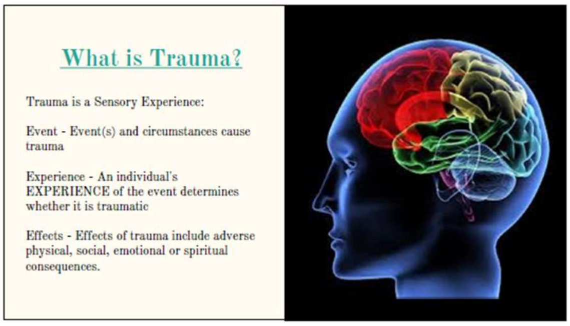
Treatments, Referrals, and Follow-Up

STI Prophylaxis (Gonorrhea, Chlamydia, Trichomoniasis)

- Pregnancy Prophylaxis (up to 120 hours)
- HIV nPep (up to 72 hours)
- Post Assault Treatment Guidelines, Referrals, Follow Up
- Ongoing Advocacy Services Provided



SEXUAL ASSAULT AND TRAUMA



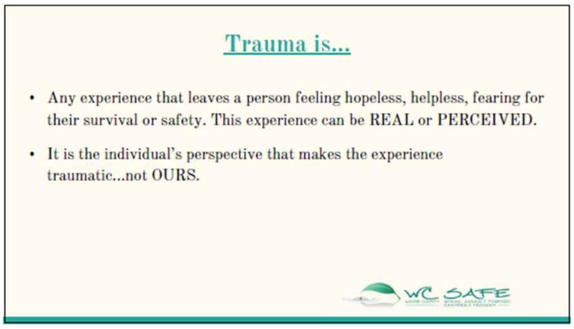
What is Trauma?

Trauma is a Sensory Experience:

Event - Event(s) and circumstances cause trauma

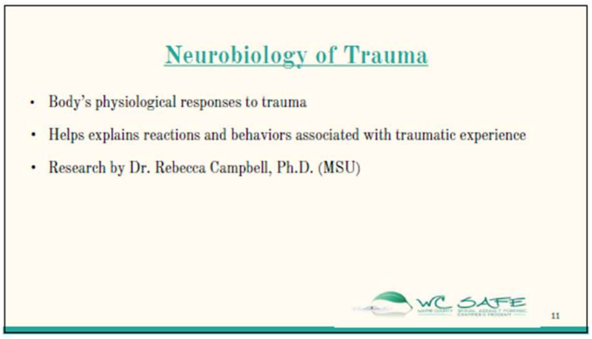
Experience - An individual's EXPERIENCE of the event determines whether it is traumatic

Effects - Effects of trauma include adverse physical, social, emotional or spiritual consequences.



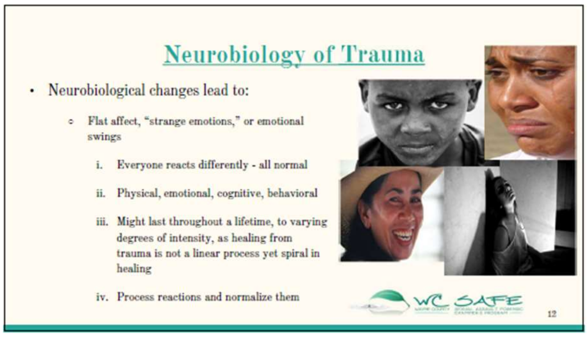
Trauma is...

- Any experience that leaves a person feeling hopeless, helpless, fearing for their survival or safety. This experience can be REAL or PERCEIVED.
- It is the individual's perspective that makes the experience traumatic...not OURS.



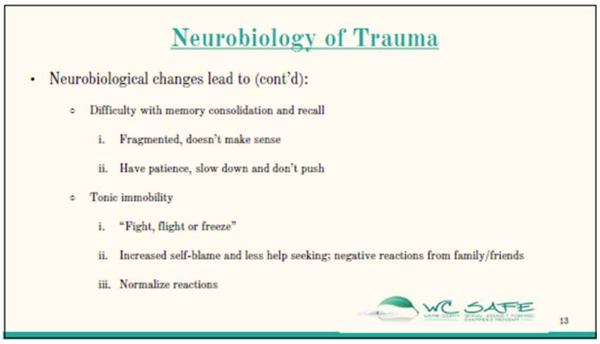
Neurobiology of Trauma

- Body's physiological responses to trauma
- Helps explains reactions and behaviors associated with traumatic experience
- Research by Dr. Rebecca Campbell, Ph.D. (MSU)



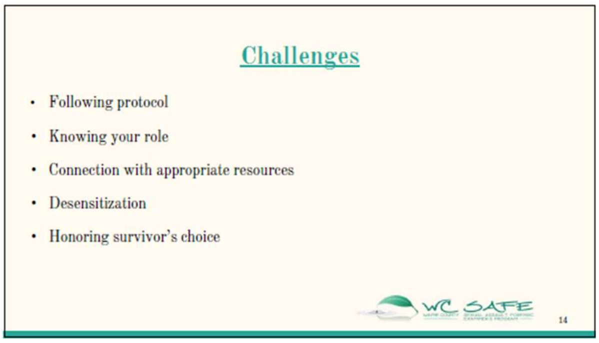
Neurobiology of Trauma

- Neurobiological changes lead to:
  - Flat affect, "strange emotions," or emotional swings
    - i. Everyone reacts differently - all normal
    - ii. Physical, emotional, cognitive, behavioral
    - iii. Might last throughout a lifetime, to varying degrees of intensity, as healing from trauma is not a linear process yet spiral in healing
    - iv. Process reactions and normalize them



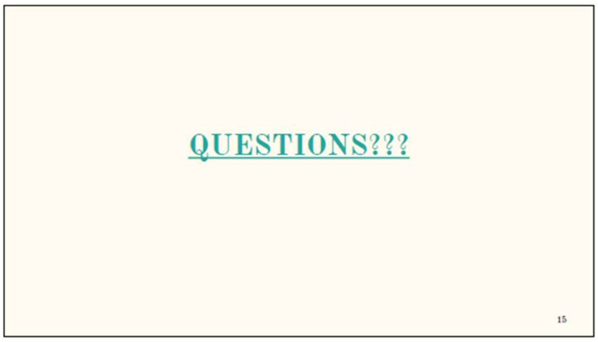
Neurobiology of Trauma

- Neurobiological changes lead to (cont'd):
  - Difficulty with memory consolidation and recall
    - i. Fragmented, doesn't make sense
    - ii. Have patience, slow down and don't push
  - Tonic immobility
    - i. "Fight, flight or freeze"
    - ii. Increased self-blame and less help seeking; negative reactions from family/friends
    - iii. Normalize reactions



Challenges

- Following protocol
- Knowing your role
- Connection with appropriate resources
- Desensitization
- Honoring survivor's choice



QUESTIONS???

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Supplementary Material 2

Title: Wayne County SAFE brochure.

WC SAFE

Mission Statement

WC SAFE inspires healing and empowerment for those affected by sexual violence through free and immediate comprehensive services; promotes public awareness; and advances social change.

By providing choices of these services in a confidential, non-judgmental atmosphere, with specially trained staff and at no cost to the patient – we focus on re-empowering survivors in order to begin the healing process, and in addition, work to end Sexual Assault in community.

Healing has no timeline.

If you or someone you know has recently been sexually assaulted, or assaulted sometime in the past~

We can help.

We have 5 clinic sites to serve you:

Sinai-Grace Hospital
6071 W. Outer Drive Detroit, Michigan 48234(NW corner of Schaefer and McNichols)

Detroit Receiving Hospital
4201 St. Antoine Detroit, Michigan 48201 (Near the I-94 / I-75 interchange)

St. John Hospital and Medical Center
22101 Moross
Detroit, MI48236
(Between Little Mack and I-94)

Taylor
12701 Telegraph Road
Taylor, Michigan 48180
(Just south of Goddard Road and I-94)

Kids Talk
40 East Ferry St Detroit, MI
48202

24-HR Crisis Line
(First Step)
1-888-453-5900

WC SAFE
WAYNE COUNTY SEXUAL ASSAULT FORENSIC EXAMINERS PROGRAM

WC SAFE

2727 SecondAvenue,
Suite 300
Detroit, Michigan
48201

Crisis Pager:
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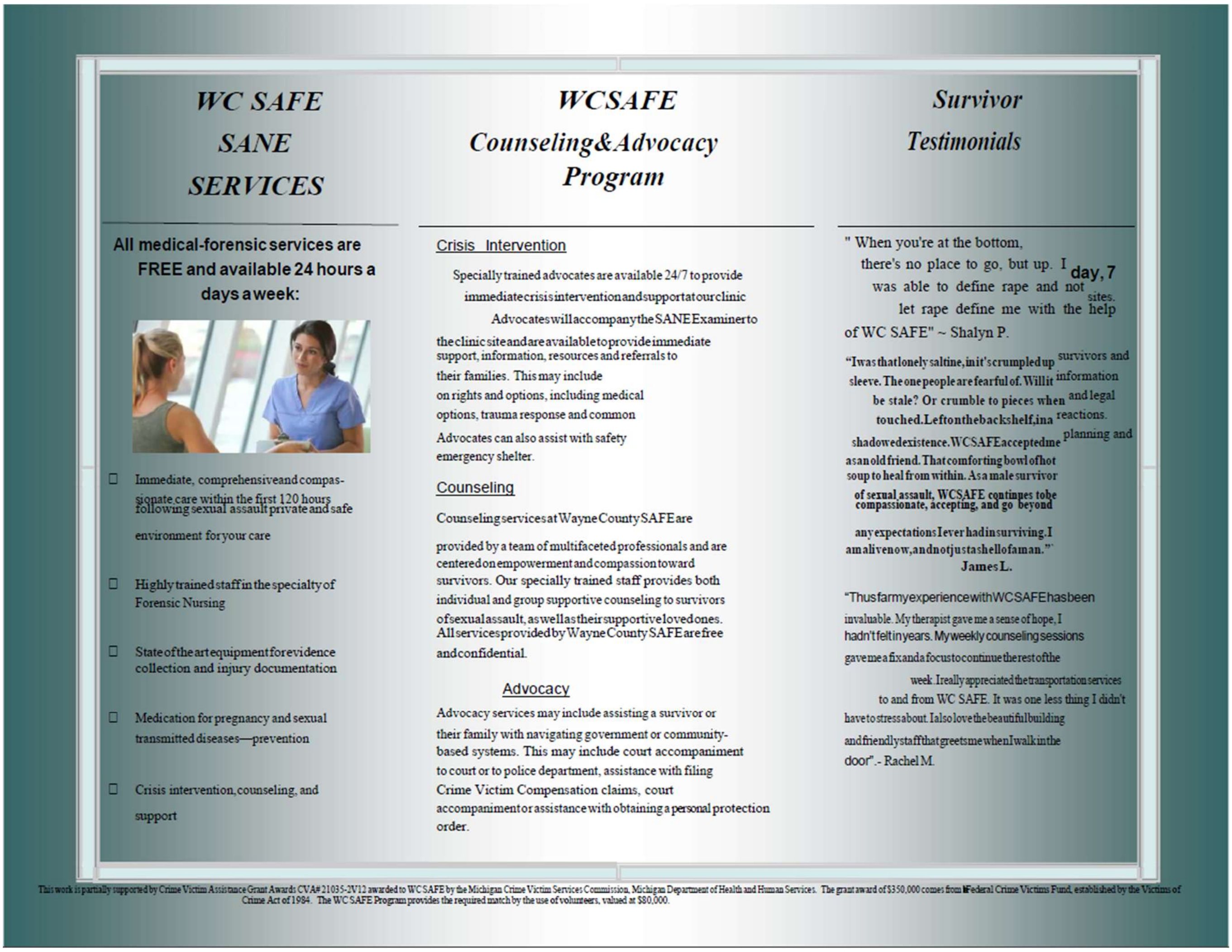
Office: 313-964-9701
Fax: 313-964-9706

WWW.WCSAFE.ORG



WC SAFE
SANE
SERVICES

All medical-forensic services are FREE and available 24 hours a days a week:

☐ Immediate, comprehensive and compassionate care within the first 120 hours following sexual assault private and safe environment for your care

☐ Highly trained staff in the specialty of Forensic Nursing

☐ State of the art equipment for evidence collection and injury documentation

☐ Medication for pregnancy and sexual transmitted diseases—prevention

☐ Crisis intervention, counseling, and support

WCSAFE
Counseling&Advocacy
Program

Crisis Intervention

Specially trained advocates are available 24/7 to provide immediate crisis intervention and support at our clinic Advocates will accompany the SANE Examiner to the clinic site and are available to provide immediate support, information, resources and referrals to their families. This may include on rights and options, including medical options, trauma response and common Advocates can also assist with safety emergency shelter.

Counseling

Counseling services at Wayne County SAFE are provided by a team of multifaceted professionals and are centered on empowerment and compassion toward survivors. Our specially trained staff provides both individual and group supportive counseling to survivors of sexual assault, as well as their supportive loved ones. All services provided by Wayne County SAFE are free and confidential.

Advocacy

Advocacy services may include assisting a survivor or their family with navigating government or community-based systems. This may include court accompaniment to court or to police department, assistance with filing Crime Victim Compensation claims, court accompaniment or assistance with obtaining a personal protection order.

Survivor
Testimonials

" When you're at the bottom, there's no place to go, but up. I was able to define rape and not let rape define me with the help of WC SAFE" ~ Shalyn P.

day, 7
sites.

"I was that lonely saltine, in it's crumpled up sleeve. The one people are fearful of. Will it be stale? Or crumble to pieces when touched. Left on the back shelf, in a shadowed existence. WCSAFE accepted me as an old friend. That comforting bowl of hot soup to heal from within. As a male survivor of sexual assault, WCSAFE continues to be compassionate, accepting, and go beyond any expectations I ever had in surviving. I am alive now, and not just a shell of a man."
James L.

survivors and
information
and legal
reactions.
planning and

"Thus far my experience with WCSAFE has been invaluable. My therapist gave me a sense of hope, I hadn't felt in years. My weekly counseling sessions gave me a fix and a focus to continue the rest of the week. I really appreciated the transportation services to and from WC SAFE. It was one less thing I didn't have to stress about. I also love the beautiful building and friendly staff that greets me when I walk in the door".- Rachel M.

This work is partially supported by Crime Victim Assistance Grant Awards CVA# 21035-2V12 awarded to WC SAFE by the Michigan Crime Victim Services Commission, Michigan Department of Health and Human Services. The grant award of $350,000 comes from the Federal Crime Victims Fund, established by the Victims of Crime Act of 1984. The WC SAFE Program provides the required match by the use of volunteers, valued at $80,000.

Supplementary Material 3

Title: Standardized Patient Guide.

The following supplemental material was provided to the standardized patient. The purpose of highlighted words was to emphasize to the standardized patients what would be important in terms of timeline or story.

Clinical Scenario:
Samantha Adams presents to the emergency department. Her vital signs are within the normal range. She says she was raped at a nightclub the night before.
Type of SP Case: Formative, Communication, Interpersonal, Counseling, Difficult Encounter (no physical exam)
Setting: Emergency Department
Case Overview: Samantha Adams is a 35-year-old female who presents to the emergency department after being raped by an ex-boyfriend the night before. The abuser had slipped the date rape drug into the patient's drink at a nightclub, and the patient remembers very little about the night. Throughout the day, she has been having recurrent flashbacks of her ex-boyfriend pinning her down an assaulting her, but she cannot recall any exact details about where and when the assault happened.

Samantha presents to the emergency department alone in significant distress and pain. She switches back and forth between isolation of affect (discussing the events without displaying emotion) and extreme sadness and guilt. She also admits she cannot remember hardly any details of the night besides her flashbacks and repeatedly asks the student doctor if it is her fault that she was assaulted.

Patient Name	Samantha Adams
Demographics	Age: 35 Female Race: N/A
Mood/Presentation	Sitting in chair with head down, arms folded in lap, shoulders hunched. Looks acutely distressed and in pain. Poor eye contact, minimal body movement. Limited spontaneous speech—must be prompted to answer questions—many of which are answered with "I'm not exactly sure what happened" or "I don't quite remember".
Dress	Has not changed clothes since last night.
Employment	Teacher
Home Life	Had been in an abusive relationship with her ex-boyfriend (the abuser), but has not been in a relationship since. (If asked: relationship ended one year ago.) No children Social drinking and smoking. No illicit drugs

History of Presenting Illness	Patient complains of: -vaginal pain upon waking up (9/10 in severity) (*What does the pain feel like? i.e. Throbbing, Sharp?*) -bruises on inner thigh -fear of pregnancy -fear of STI -panic attack this morning upon waking up -forgetfulness about the events of the night prior ***must ask student: -"what is a rape kit?" -"will you be performing the rape kit?" -"do I have to do a rape kit?" -"do I have to press charges?" No other medications or illnesses
Opening Statement	"I am so scared. Who can help me?"
Task	-demonstrate compassion, concern, and empathy -knows to call WC-SAFE -knows that a certified professional will perform the rape kit -mentions that the rape kit is time sensitive -tells patient they do not have to complete the rape kit or press charges if they choose not to -shows concern for patient's safety upon discharge

Supplementary Material 4

Title: Kalamazoo Essential Elements Communication Checklist.

In order for a student to receive an “excellent” rating, all bullet points must have been completed.

A. Builds a Relationship (includes the following):	**1 Poor**	**2 Fair**	**3 Good**	**4 Very Good**	**5 Excellent**
· Greets and shows interest in patient as a person · Uses words that show care and concern throughout the interview · Uses tone, pace, eye contact, and posture that shows care and concern					
B. Opens the Discussion (includes the following):					
· Allows patient to complete opening statement without interruption · Asks “Is there anything else?” to elicit full set of concerns · Explains and/or negotiates an agenda for the visit					
C. Gathers Information (includes the following):					
· Begins with patient’s story using open-ended questions (e.g. “tell me about…) · Clarifies details as necessary with more specific or “yes/no questions” · Summarizes and gives patient opportunity to correct or add information · Transitions effectively to additional questions					
D. Understands Patient’s Perspective (includes the following):					
· Asks about life events, circumstances, other people that might affect health · Elicits patient’s beliefs, concerns and expectations about illness and treatment · Responds explicitly to patient’s statements about ideas and feelings					
E. Shares Information (includes the following):					
· Assesses patient’s understanding of problem and desire for more information · Explains using words that patient can understand · Checks for mutual understanding of treatment plan · Asks if patient has any questions					
F. Reaches Agreement (if new/changed plan) (includes the following):					
· Includes patient in choices and decisions to the extent s/he desires · Asks about patients ability to follow diagnostic and/or treatment plans · Identifies additional resources as appropriate					
G. Provides Closure (includes the following):					
· Asks if patient has questions, concerns or other issues · Summarizes/asks patient to summarize plans until next visit · Clarifies follow-up or contact arrangements · Acknowledges patient and closes interview					

Supplementary Material 5

Title: WC-SAFE Sexual Assault and Trauma Informed Care Checklist.

In order to receive all six points, students had to complete each bullet point below.

Educated Response to Scenario (includes the following):	Included (Hit)	Not Included (Miss)
Knows to call WC-SAFE		
Knows that a certified professional will perform the rape kit		
Mentions that rape kit is time sensitive		
Informs patient that they do not have to complete rape kit or press charges if they choose not		
Offers counseling (social worker, rape counselor, or domestic violence counselor)		
Shows concern for patient's safety upon discharge		

IJMS INTERNATIONAL JOURNAL *of* MEDICAL STUDENTS

Original Article

Glucometers for Patients with Type 2 Diabetes Mellitus: Are they helpful?

Andrew Thomas,[1] Mohan T Shenoy,[2] K.T. Shenoy,[3] Nirmal George.[4]

Abstract

Background: The effectiveness of self-monitoring of blood glucose (SMBG) in type 2 diabetes mellitus (T2DM) patients is debated in the literature. We aimed at elucidating the association and patterns of complications between SMBG use and plasma glucose values. **Methods:** This cross-sectional study comprised 303 participants from outpatient departments with T2DM for over 12 months. We analyzed sociodemographic and clinical variables including: anthropometry, SMBG use, disease duration, treatment modality, complications, plasma glucose level, and glycated hemoglobin level (%). **Results:** The mean duration of T2DM was 93 ± 76 months. Participants were grouped into SMBG users (n=115, 38%) and non-SMBG users (n=188, 62%). The mean fasting plasma glucose levels of SMBG and non-SMBG users were 140.7±42.7 (95% Confidence Interval [95%CI]: 132.72;148.67) mg/dl and 145.4±50 (95%CI: 138.12;152.67) mg/dl (p=0.03), respectively. The mean post-prandial plasma glucose levels of the SMBG and non-SMBG groups were 202 ± 63.42 (95%CI: 190.23;213.76) mg/dl and 209±84.54 (95%CI: 196.56;221.43) mg/dl (p=0.002), respectively. The mean difference in HbA1c among the groups were 8.14±1.69% (95%CI: 7.59;8.68) and 8.15±1.98% (95%CI: 7.27;9.02) (p=0.4), respectively. Hypoglycemia (n=50, 43.5%) was the most common complication. The prevalence of neuropathy (n=5, 4.3%, p=0.036) and cardiovascular disease (n=21, 18.3%, p=0.042) were significantly higher in the SMBG group. **Conclusion:** Although plasma glucose values were significantly lower in the SMBG group, its clinical significance remains questionable. Furthermore, many participants in both groups had shortfalls in awareness, monitoring, and glycemic control. SMBG use needs to be evaluated in a cohort of patients with T2DM with adequate health awareness.

Key Words: Blood Glucose Self-Monitoring; Type 2 Diabetes Mellitus; Glycemic Control; Blood glucose; Diabetes Complications (Source: MeSH-NLM).

Introduction

India is a country with a high incidence of diabetes mellitus. The morbidity and mortality related to this disease are enormous and pose a significant burden on the public health of this country in the future.[1] Venous plasma and capillary whole blood methods are two ways of estimating blood glucose level. The venous plasma glucose level is slightly higher in random and fasting glucose estimation, but lower than capillary whole blood glucose level for samples taken 2 hours after glucose is given orally. However, the diagnostic criteria are similar between these two methods of estimation.[2] According to the American Diabetic Association (ADA), random blood glucose values of 79–140 mg/dl are considered normal; 140–200 mg/dl, pre-diabetes; and a value above 200 mg/dl, diabetes. In terms of glycated hemoglobin levels, values less than 6.5% are normal, whereas values between 5.7% and 6.7% are considered high risk.[3, 4] Control of blood glucose is important in preventing diabetes-associated complications; however, over 70% of all patients diagnosed with diabetes have uncontrolled diabetes.[5]

Some may argue that self-monitoring of blood glucose (SMBG) can be recommended for all patients with type 2 diabetes mellitus (T2DM).[6] This is because SMBG can be useful in detecting hypoglycemia and hyperglycemia. Furthermore, high blood glucose levels encourage patients to improve their diet and physical activity. Multiple SMBG measurements taken over a period of time may also be helpful for physicians to monitor their patients and modify their treatment if needed.[6, 7] Glycemic variability is a term used to describe the fluctuations of glucose levels. While SMBG may provide diurnal glucose profile, continuous glucose monitoring (CCM) is considered helpful in detecting glycemic variability.[8]

The data on SMBG practice among patients with T2DM are not well understood. Many studies have been conducted to estimate the effectiveness of SMBG practice, especially among non-insulin-treated patients. Some studies revealed no association between in SMBG and glycemic control, whereas others indicated the benefits of SMBG use.[9–14] A reduction in hemoglobin A1C (HbA1C) of 0.5% was found when the patients were better educated to interpret the values of SMBG.[7] Physicians need to monitor patients with T2DM regularly, because the effectiveness of SMBG is dependent both on patients and appropriate glucometer use.[15] Patients should be made aware that practicing SMBG alone will not improve their glycemic control. Good glycemic control is attained only when data obtained are properly interpreted to modify treatment strategies. This study aimed at elucidating the use of SMBG in patients with T2DM by comparing glycemic levels and complication rates among SMBG and non-SMBG users.

Methods

This was a cross-sectional study conducted from May to June 2019. The project was approved by the Institutional Ethical Committee of Sree Gokulam Medical College and Research Foundation **(SGMC-IEC no.: 34/450/05/2019).** Each participant provided a written informed consent before the commencement of the study.

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Sree Gokulam Medical College and Research Foundation (SGMC&RF) is a tertiary health center located at Thiruvananthapuram in the state of Kerala, India. Study participants were selected by convenient sampling from the outpatient departments of General medicine, General Surgery, Orthopedics, Endocrinology, Diabetology, and Gastroenterology of SGMC&RF. Participants with T2DM for over 12 months and those aged at least 18 years were included in the study. Pregnant women were excluded from the study.

Socio-demographics, anthropometry (height in cm and weight in Kg), duration of disease (in months), current treatment pattern [6 treatment modalities, namely insulin preparations, oral hypoglycemic drugs except metformin monotherapy, metformin monotherapy, alternative drug therapy like Ayurveda or Homeopathy, combination therapy (insulin and oral hypoglycemic drugs), and no treatment], recent plasma glucose values (fasting, post-prandial in mg/dl, and HbA1C as a percentage), co-morbidities, such as hypertension, dyslipidemia, hypo- and hyperthyroidism, bronchial asthma, cardiovascular disease (cardiac failure, arrhythmias, and myocardial infarction), stroke (both ischemic and hemorrhagic), neuropathy, nephropathy, and retinopathy, and pattern of SMBG use (duration, frequency) were the variables studied.

Awareness and practice of SMBG among the study participants were enquired and noted. Following data collection, all participants were educated on disease progression and appropriate SMBG practice.

Data were collected through interviews lasting 15 minutes conducted by the principal investigator, using questionnaires on SMBG practice. Height and weight were measured for calculating BMI. Laboratory records, such as blood glucose, lipid profile, and HbA1C, were perused from the electronic records database with patients' permission. Only their most recent blood values were used in the study for analysis. All eligible and consenting participants were recruited to minimize the selection and sampling bias.

The sample size was estimated based on a previous report[15] using the Open-Epi (Open-Source Epidemiologic Statistics for Public Health)[16] software. A proportion of 52.4% was assumed to be SMBG users with a precision of 5%, alpha error (0.05), and power of 90%; the required sample size was calculated. All quantitative variables were compared using the mean and standard deviation.

The association between SMBG practice and plasma glucose values was assessed using the independent t-test. Chi-square test and odds ratio with 95% Confidence Interval (95%CI) were used to determine the association between complications and SMBG practice. A sub-group analysis among the non-insulin-taking participants was performed to determine the association between SMBG use and glycemic values of non-insulin-taking participants. A p-value <0.05 was considered statistically significant. SPSS version 25 (Statistical Package for the Social Sciences, SPSS Inc., U.S.A) was used for all data analyses. Sensitivity analysis was not performed.

Results

Respondent Characteristics

Overall, 303 participants were interviewed in our study, of which 171 (56.4%) were males and 132 (43.6%) were females. Age-wise, 141 (46.5%) and 162 (53.5%) participants were above and below 60 years, respectively (p=0.191). The total population age average was 59.61 ± 10.26 years. The mean duration of T2DM in our study sample was 93.5 months. The BMI of 294 participants were assessed using the Asian BMI criteria[17] ***(Table 1)***. Nine participants were excluded from this analysis due to missing information, after which 147 (50%), 64 (21.8%), 76 (25.8%), and 7 (2.5%) participants were determined to be obese, overweight, normal (18.5 to 23 kg/m^2), and underweight, respectively. No statistically significant difference in BMI was observed between SMBG and non-SMBG users (p=0.2).

SMBG Practice

The study participants were classified into SMBG (115, 38%) and non-SMBG groups (188, 62%). Among the SMBG group, 96 (83.5%), 8 (7%), 5 (4.3%), 4 (3.5%), and 2 (1.7%) participants practiced SMBG irregularly, once weekly, once monthly, once daily, and multiple times a day, respectively.

Table 1. Participants Classified According Asian BMI Criteria

Asian BMI criteria	SMBG group	Non-SMBG group
Underweight (<18.5 kg/m^2)	7	0
Normal (18.5–23 kg/m^2)	44	32
Overweight (23.1–27.5 kg/m^2)	37	27
Obese (.27.5 kg/m^2)	92	55

A summary of different treatment modalities administered to the study participants is given in ***Table 2***. Metformin monotherapy administered to 113 (37.3%) participants was the most common treatment modality, whereas 51 (16.8%) and 63 (20.8%) participants were on insulin monotherapy and combined therapy with insulin and oral hypoglycemic drugs, respectively. Participants were grouped based on insulin use for sub-group analysis. No significant difference was observed between them.

Table 2. Treatment Modalities Used by Study Participants for Control of Type 2 Diabetes Mellitus.

Treatment	SMBG group (n=115)	Non- SMBG group (n=188)	p-value
Metformin	30 (26.1%)	83 (44.1%)	0.002ǂ
Monotherapy with oral anti-diabetic drugs (except metformin)	13 (11.3%)	20 (10.6%)	0.86ǂ
Combination of more than one oral anti-diabetic drugs	7 (6.1%)	11 (5.9%)	0.93ǂ
Insulin Preparations	23 (20%)	28 (14.9%)	0.25ǂ
Insulin and oral anti-diabetic drugs	32 (27.8%)	31 (16.5%)	0.02ǂ
Alternative medicine*	3 (2.6%)	1 (0.5%)	0.15‡
No medications	7 (6.1%)	14 (7.4%)	0.65ǂ

Legend: * Alternative medicine includes Ayurveda, Siddha, Unani, and Homeopathy treatments. ǂ Chi2, ‡ Fisher's exact test

Most of the participants (79, 68.7%) performed SMBG after overnight fasting, whereas 3 (2.6%) and 33 (28.7%) participants performed it 2 hours after eating and randomly, respectively. More than half (74, 64.3%) of the participants felt they were not adequately educated about SMBG use. Among the SMBG users, only 38 (33%) participants modified their treatment using SMBG values. The other 78 (67.8%) participants began exercising and had diet modifications because of SMBG use.

In all, 60 (52.2%) participants said they would verify the SMBG values by performing follow-up tests in certified laboratories. However, 48 (41.7%) participants did not confirm their SMBG values at any laboratories. Only 7 (6.1%) participants consulted physicians on their SMBG values.

SMBG Use and Glycemic Levels

The mean plasma glucose and HbA1c levels of the SMBG and non-SMBG groups were compared using t-test (***Figure 1***). The fasting plasma glucose levels of 297 participants were analyzed. Among them, 113 participants practiced SMBG. The mean plasma fasting glucose levels were 140.47±42.7 (95%CI: 132.72–148.67) mg/dl and 145.4±50 (95%CI: 138.12; 152.67).

Figure 1. Association between glycemic levels and SMBG use. (A) Mean fasting and Post-prandial plasma glucose between SMBG and Non-SMBG groups. (B) Mean HbA1c between SMBG and Non-SMBG groups. (*) denotes significant difference (p value less than 0.05).

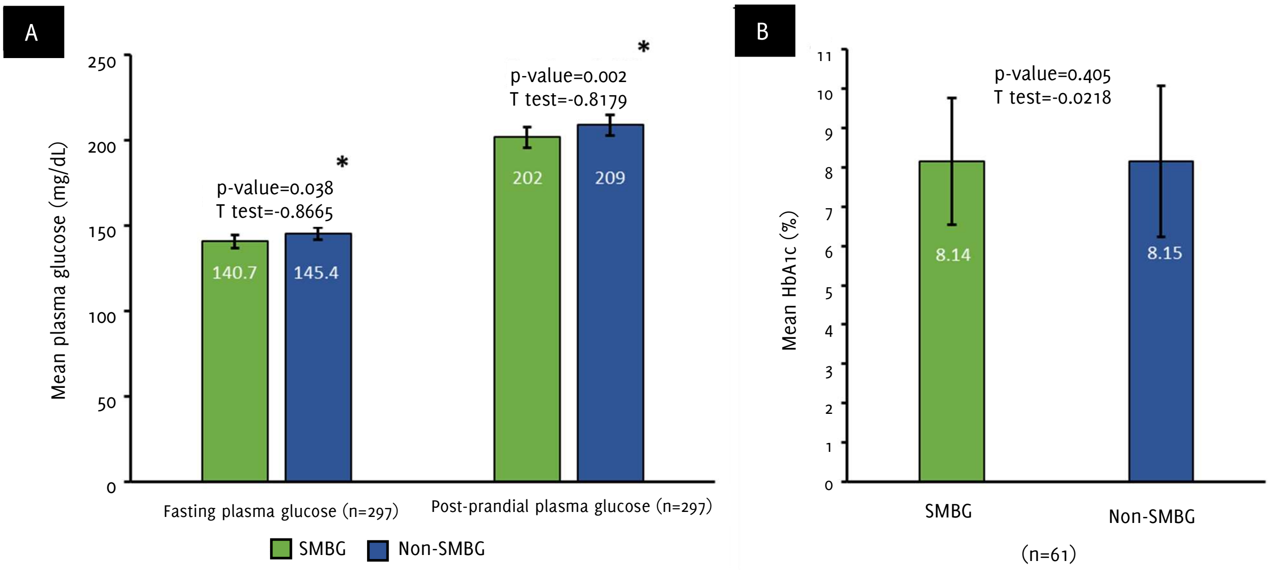


Table 3. Frequency of complications and co-morbidities observed in study participants

Complications and Co-morbidities	Total (n=303)	SMBG group (n=115)	Non- SMBG group (n=188)	P value
Retinopathy	54 (17.8%)	25 (21.7%)	29 (15.4%)	0.16
Nephropathy	10 (3.3%)	5 (4.3%)	5 (2.7%)	0.42
Neuropathy	20 (6.6%)	12 (10.4%)	8 (4.3%)	0.04
Hypoglycemia	117 (38.6%)	50 (43.5%)	67 (35.6%)	0.17
Cardiovascular disease	40 (13.2%)	21 (18.3%)	19 (10.1%)	0.04
Stroke	8 (2.6%)	4 (3.5%)	4 (2.1%)	0.48
Hypertension	151 (49.8%)	49 (42.6%)	102 (54.3%)	0.04
Dyslipidemia	141 (46.5%)	51 (44.3%)	90 (47.9%)	0.55
Thyroid dysfunction	45 (14.9%)	15 (13%)	30 (16%)	0.49

prandial (7 mg/dl, p=0.002) plasma glucose. HbA1c levels of the SMBG and non-SMBG groups were 8.14%±1.69 (95%CI: 7.59-8.68) and 8.15%±1.98 (95%CI: 7.27-9.02), respectively. However, no significant difference was observed in the mean HbA1c levels between both groups. A sub-group analysis with t-test was conducted for the non-insulin users. No statistically significant difference was identified between both groups, in terms of their fasting (p=0.4, t=-0.8), post-prandial (p=0.9, t=0.1), or HbA1c levels (p=0.7, t=0.3).

Complication Comparison Between SMBG and Non-SMBG Participants

Table 3 summarizes the pattern of complications and co-morbidities. Out of the 303 participants, 117 (38%) had hypoglycemia, which was the most common complication (p=0.17). Fifty-nine (19.5%) participants had at least one micro-vascular (retinopathy, nephropathy, and neuropathy) complication, and 45 (14.8%) participants had at least one macro-vascular (cardiovascular diseases and stroke) complication.

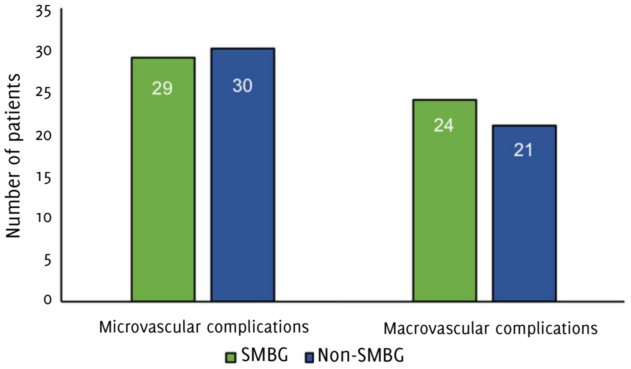
More participants who practiced SMBG had neuropathy (n=12, 10.4%, p=0.03) and cardiovascular disease (n=21, 18.3%, 0.04). The odds ratios (OR) of micro-vascular (OR=1.8, 95%CI=1.00–3.2) and macro-vascular complications (OR=2.1, 95%CI=1.1–3.9) were significantly different when analyzing SMBG and non-SMBG groups, as summarized in ***Figure 2***. Micro-vascular and macro-vascular complications were prevalent in both the non-SMBG and SMBG groups.

Discussion

The usefulness of SMBG practice among patients with T2DM, especially those without insulin medication, is doubtful in the literature. We conducted a cross-sectional study among 303 patients with T2DM patients with and without SMBG practice, and compared their fasting, post-prandial and HbA1c values. The mean HbA1c values did not differ between the two groups. While the mean plasma glucose values between the groups may be statistically significant, the differences were too infinitesimal to produce a clinically significant difference. A mere 7 mg/dl difference in post-prandial glucose is doubtful to elicit a clinically significant difference in practice.[18]

One of the specific goals for practicing SMBG is to detect and prevent hypoglycemia.[20] Contrary to this, hypoglycemia was the most common complication observed in the participants. Furthermore, no statistically significant difference existed in the proportion of hypoglycemia between SMBG and non-SMBG groups, as reported in literature.[21]

***Figure 2.* Frequency of** micro-vascular and macro-vascular complications among SMBG and non-SMBG users. (a) denotes odds ratio 1.8, 95%Cl 1.001;3.2, p=0.048; (b) denotes Odds ratio 2.1, 95%Cl 1.1;3.9, p=0.021.



Most of the complications, except neuropathy and cardiovascular disease, had no statistically significant differences between the two groups. The leading cause of mortality and morbidity in patients with diabetes is related to cardiovascular events.[22] A weak, yet significant association between SMBG use and cardiovascular disease has been reported.[23] Huang et al. [24] observed that frequent SMBG monitoring decreased micro-vascular complications. One interesting finding was that neuropathy and cardiovascular diseases were more prevalent in the SMBG group with statistical significance. Overall, our study observed that more micro-vascular complications were present in the non-SMBG group (29 vs. 30), whereas more macro-vascular complications were present in the SMBG group (24 vs. 21). However, these complications may not be associated with SMBG use. A possible explanation for this finding might be that participants with more complications used SMBG because of severe disease.

SMBG use in T2DM is debated in the literature. Improvement in glycemic control can only be found if the patient is educated about the appropriate ways of practicing SMBG.[25, 26] Many patients in our study were not satisfied with the health education they received from the healthcare provider. Most patients practiced SMBG irregularly and did not confirm or consult physicians on results. This might be the reason for poor response to SMBG practice in our study setting. Perhaps, the most concerning finding in our study was that mean fasting, post-prandial, and HbA1C of both groups were significantly higher than the recommended glycemic targets by American Diabetes Association (ADA), American College of Endocrinologists, and International Diabetes Federation (IDF).[19] In India, education on diabetes is not enough to impart adequate awareness and monitoring status of glycemic control.[27] Thus, determining the efficiency of SMBG is challenging.

The effectiveness of SMBG especially among patients with T2DM who are not on insulin therapy is debated in the literature. A systematic review and meta-analysis conducted in 2012 included 12 randomized controlled trials. They concluded that the effect of SMBG lasted only about six months in these patients. Furthermore, they also observed that the effectiveness decreases after one year.[28] Another multicenter analysis on 24,500 patients from 191 centers observed that patients with T2DM on oral hypoglycemic agents or nutrition therapy derived no apparent benefits from SMBG.[29] These findings are similar to those of our study. One prospective study conducted among 689 patients observed benefits in patients who performed SMBG, but observed a 0.3% reduction in HbA1c level (8.1 ± 1.6% vs. 8.4 ± 1.4%, p = 0.012). Thus, any claims of significant clinical effects of SMBG among SMBG users are doubtful.[13]

The study had few limitations. First, information bias due to reliance on self-declared information was most likely. Second, ideally, a randomized controlled trial would be better to ascertain the differences between the SMBG and non-SMBG groups. Third, while we only included participants who practiced SMBG for at least 6 months, we did not analyze the duration of SMBG use with their glycemic values.

Even though our study indicated a significant difference in fasting and post-prandial plasma glucose, participants had shortfalls in awareness, practice, and control of diabetes. Further studies using randomized controlled trials and meta-analysis should be conducted on patients with T2DM using SMBG to determine its effectiveness and establish standard guidelines for SMBG practice.

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Review

A Literature Review of Possible Barriers and Knowledge Gaps of General Practitioners in Implementing Advance Care Planning in Ireland: Experience from Other Countries

Karendeep Somal,[1] Tony Foley.[2]

Abstract

Background: An Advance Care Plan (ACP) is a decision-making process concerning end-of-life care that embodies a patient's values and preferences, for a time when patients are unable to make such choices on their own. ACPs have been employed into medical practices worldwide; however, they remain largely uncompleted by general practitioners (GPs), regardless of their benefits to patients and their families with respect to end of life (EOL) care. Furthermore, ACPs will soon be implemented into clinician practices across Ireland, as part of the Assisted Decision Making (Capacity) Act 2015. This review aims to explore the literature to examine challenges GPs may face in employing ACPs into clinical practice. **Methods:** An electronic search was performed through three databases: PubMed, MEDLINE, and CINAHL Plus, through which a total of eleven studies met the selection criteria. Additionally, three studies were provided by experts in the field. Thus, a total of fourteen studies were condensed and critically appraised through CASP (Critical Appraisal Skills Program), which concluded that the quality of the studies was high. **Conclusion:** Through this review, knowledge gaps and barriers for GPs regarding ACPs were identified. Barriers for implementing ACPs into practice were categorized into three major themes: barriers for the GPs, barriers in the healthcare system, and barriers regarding the patient. These included insufficient time, complexity of the ACP documents themselves, uncertainty of the disease prognosis, and the ultimate fear of inducing anxiety and loss of hope in patients.

Key Words: General Practitioners; General Practice; Advance Care Planning; Advance Care; End of Life Care; Terminal Care (Source: MeSH-NLM).

Introduction

The average life expectancy has increased as technology and medical breakthroughs continue to improve. As the population ages end of life (EOL) care issues become increasingly important. Individuals have preferences when it comes to their final days, which has created a large demand for Advance Care Planning.[1]

An Advance Care Plan (ACP) provides instructions on healthcare procedures that a person may choose when they no longer have the capacity to do so.[1,2] It can be made freely by patients <18 years of age who are capable of making decisions, and only comes into play if they lose this capacity to make decisions in the future.[2] Patients' views, attitudes, and aspirations concerning their healthcare and treatment preferences regarding how they will die are taken into account by ACPs.[3,4] ACPs were originally created in the late 1990s in the United States of America[5]. Although they have been around for many years, their utilization by physicians remains moderately low, especially in regions outside of the USA. It has been described that ACPs are more prevalent in the USA than throughout Europe.[6]

ACPs have several advantages, including allowing patients to take charge of their own health, reducing worry about death, and eventually reducing pain and unnecessary treatments that may prolong life needlessly.[7,8] They've also been found to help patients' family feel less worried and burdened.[4,9,10]

ACPs can lead to advance healthcare directives (AHCDs); however, AHCDs are legally drafted papers, whereas ACPs do not always require paperwork, and can be completed merely through discussions between the physician and patient.[11,12] In addition, unlike ACPs, AHCDs take into account particular restricted conditions and treatments, as well as the refusal of such therapies.[11,13]

ACPs are recommended to be performed by the patient's general practitioner (GP), as they are the ones who are most involved in EOL care.[14,15] Over time, GPs have built strong, trustworthy patient-provider relationships that should promote such talks, since patients may feel more at ease discussing their concerns such material with a trustworthy doctor.[14,17] ACPs are created with patients, their GP, and, sometimes family members and other healthcare providers.[14,16] To begin the process, GPs are required to assess their patient's mental capacity. Capacity is the ability to grasp the importance and nature of the decision being made in the context of the available options.[17] Furthermore, an individual must be able to comprehend, remember, and consider the information presented before being able to successfully convey their decision.[2,17]

The exact completion of ACPs by GPs in Ireland is currently unknown, however it does remain fairly low.[18] Furthermore, there is currently no legislation in action in Ireland to govern ACPs or AHCDs. The Assisted Decision Making (Capacity) Act 2015 was signed into Irish law on December 30th, 2015 to support an individual's decision-making regarding EOL care.[19] However, its commencement remains incomplete, as numerous challenges to the health sector regarding its implementation remain unsettled.

As previously mentioned, it has been advised that ACPs should be completed by a patient and their GP. However, previous studies have illustrated that majority of GPs do not complete ACPs, even though they

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have been shown to improve patient satisfaction and quality of life.[16] ACPs have been shown to increase relationship satisfaction between patients and their families, increase psychological well-being, and ultimately enlist a sense of control in patients.[20,21] Nonetheless, it has been noted that Irish individuals are less likely to plan ahead for their own death, and thus this may create an additional barrier.[18]

This review thus aims to identify potential limitations in implementing ACPs into clinics, along with the current understanding and knowledge of GPs regarding ACPs. This study will also examine the potential barriers GPs perceive regarding its employment into daily practice.

The aims of this study were to condense and appraise the existing literature regarding GPs' perspectives regarding ACPs and their use in everyday clinical practice. The specific objectives were: (i) to establish the level of knowledge of GPs regarding ACPs; (ii) to establish the perspective of GPs regarding ACPs; and (iii) to establish the current barriers in implementing ACPs into daily clinical practice.

Methods

Search Strategy

On 12th April 2019, electronic searches were conducted using a total of three databases to retrieve the relevant articles that may answer the research objectives of this review. The primary search was conducted through PubMed, and EBSCOhost research databases, which include MEDLINE and CINAHL Plus. The following strategy was assumed: "Advance Care" [Title] AND "General Practice" [All Fields] or "General Pract*" [All Fields]

The equation initially generated 156 results from PubMed, 122 results from MEDLINE, and 45 results from CINAHL Plus. Any duplicates were removed. Inclusion and exclusion criteria, found in ***Table 1***, were applied to the abstracts and then to the full articles remaining. This search yielded a total of eleven articles that were used in the review. *Figure 1* details the search selection process. Critical appraisal was carried out on all 14 studies via CASP (Critical Appraisal Skills Program), which concluded that the quality of the studies was high. Thirteen of the fourteen studies used a qualitative methodology, so the CASP qualitative checklist was applied (Supplementary ***Table 2***). Additionally, 2 studies conducted systematic reviews and thus the systematic review CASP checklist was utilized in these cases (Supplementary ***Table 3***).

Table 1. Selection Criteria.

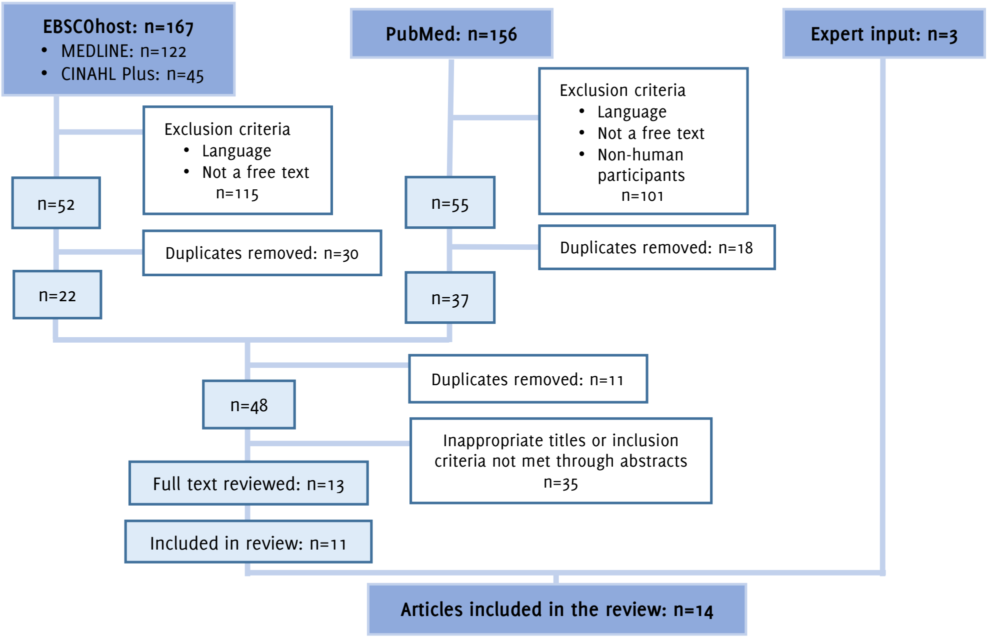
Inclusion Criteria	Exclusion Criteria
Assessed GPs perspectives towards ACPs	Articles not available as free full texts
Evaluated GPs' knowledge of ACPs	Studies not written in English
Evaluated barriers for GPs regarding ACPs	Studies conducted on animal populations
Assessed ACPs implementation into clinical practice	Studies were part of book chapters
Studies conducted on the human population	
Studies available in English	
Articles available as free full texts	

Selection Criteria

Table 1 depicts the article inclusion and exclusion criteria. Articles that were translated to the English language were excluded from this literature review to avoid errors attributed to translation. Due to the limited amount of research regarding the implementation of ACPs into clinical practice, there was no specific timeframe set for the articles. Also, articles that were not available as free full texts were excluded. The 323 articles produced from the initial search using PubMed and the EBSCOhost Research Databases were filtered using the aforementioned criteria, and duplicates were removed. This resulted in 48 articles, that were then manually filtered by titles and abstracts. Articles without a methodology section, and articles considering EOL processes other than ACPs were removed, yielding 13 articles. These 13 articles were then reviewed as full-texts. Many articles considered the patient's perspective regarding ACPs instead of that of the physician, and thus were removed. Furthermore, some articles only considered ACPs for dementia patients specifically and not the wider population, removing such articles yielded 11 articles. In addition, 3 articles were obtained through expert input in the field. These last 3 articles were utilized to create the questionnaire that will be implemented in the future study. Overall, there were a total of 14 articles used in the review to answer the objectives.

A summary flowchart depicting the study selection process is illustrated in ***Figure 1***.

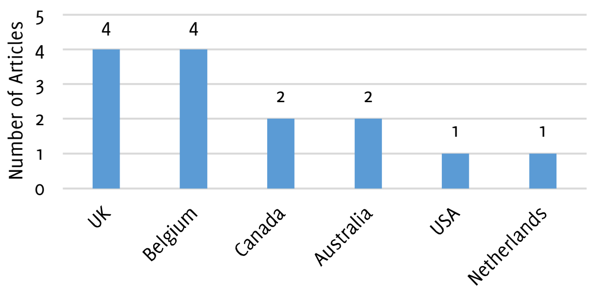
Figure 1. Selection Process Flow Chart.



Results

The 14 studies included in the review were conducted in the UK, Belgium, Australia, Canada, USA, and the Netherlands (***Figure 2***). Of these 14 qualitative studies, 5 used semi-structured interviews, 5 used questionnaires, 2 used focus groups, 1 used a systematic literature review, and 1 used both a literature review and focus group approach. All results relevant to the current review are summarized in Supplementary ***Table 4***.

Figure 2. Demographics of Included Studies.



Of the 323 relevant articles found, 11 records met the selection criteria. Additionally, 3 studies were included through recommendation by experts in the field; thus, 14 studies in total were reviewed. The use of qualitative methodology was appropriate, as the studies set out to determine the subjective experience and perspective of GPs regarding ACPs. In studies involving interviews, the presence of interview bias was at times unknown. However, one study did mention that interview biases may have played a role, as the interviewer was a member of the faculty that was being interviewed, which may have altered the findings. Furthermore, one of the studies conducting surveys did not base their questionnaire on a previously validated survey and did not discuss how they developed their own survey. It was therefore assumed that the questionnaire utilized was not validated. Additionally, in one of the studies conducting systemic reviews, the methodology of the included articles was inconsistent, hence combining their results may not be accurate.

Themes

Current Knowledge of GPs regarding ACPs

This review found that the current understanding of GPs concerning ACPs is inadequate. GPs are unsure of when and how to initiate EOL care discussions.[2,3,17] They have not received adequate training regarding ACP documents, including how to initiate such a sensitive topic and whom to include in the process.[14,19,22] It was also shown that ACPs are conducted in a distinct manner, depending on if they are completed in an out-patient versus in-patient setting, and in rural or urban areas.[16,23] No single technique has been implemented in conducting ACPs across different settings, hence, the understanding of ACPs by GPs is fairly poor.

Barriers in Implementing ACPs into Clinical Practice

All fourteen studies revealed overlapping barriers for implementing ACPs into practice that fell into three categories: barriers for the GP, barriers in the healthcare system itself, and barriers involving the patients (***Figure 3***). Each of these will be described independently below.

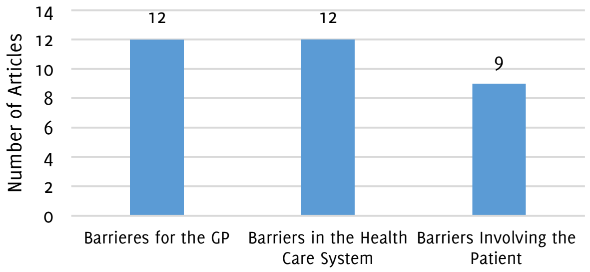
Barriers for the GP

Twelve studies determined barriers for healthcare workers in conducting ACPs. Nine studies looked solely at GPs.[1,3,13,14,16,17,19,22,24] From these studies, one of the main barriers for GPs included the fear of eliciting anxiety and loss of hope in their patients,[2,9,14,16,17,19] as well as imposing personal distress on themselves[1,22]. GPs were also unsure on when to introduce such discussions and whom to involve, such as family members or other healthcare professionals.[2,3,14] Even when ACPs were initiated, many GPs felt a lack of confidence in their abilities, due to their poor understanding of ACPs and scarce EOL care experience.[2,3,11,13,16,17,19,22,23]

Barriers in the Health Care System

The current healthcare system has not appropriately prepared GPs to initiate ACPs. Essentially, there is insufficient time available in consultations to complete such a process and provide empathy for family members and the patient themselves.[3,11,17,22,24] Likewise, there is no means of compensation provided for conducting ACPs, which leaves little incentive for GPs to complete them.[23] Additionally, there is no means of communication between GPs and specialist physicians that take over patient care towards the EOL or in debilitating conditions, thus hindering GPs from proceeding with ACPs.[1,3,16]

Figure 3. Major Themes of Articles



Furthermore, the process itself is tedious and paper-based. As many GP practices have shifted towards electronic databases, paper-based documentation is unsuitable.[19,24] The healthcare system has not created a single system to incorporate ACPs into practice with ease, which impedes physicians' confidence levels regarding their execution.[16,17]

Barriers Involving the Patient

ACP discussions can involve family members; however, many members may be in denial of their loved one's diagnosis or have disagreements concerning their preference of care. This can result in added difficulty for physicians to commence the necessary modifications required to ensure that patients' EOL care needs are met.[1,13] Multiple studies concluded that lack of understanding of the diagnosis, disease trajectory, and available treatment options for both the GP and the patient were probable barriers.[2,3,11,17,23,24] Additionally, patients lack an understanding of ACPs, as no information about ACPs is provided to patients, which in itself, hinders such a process.[24] It was also illustrated that many patients' requests are vague and may change overtime, making it difficult to meet their needs based on the resources currently available in the health system.[2,3]

Discussion

This review attempted to explore the current knowledge of GPs regarding ACPs, and the barriers that exist concerning their implementation into everyday clinical practice.

Knowledge of GPs regarding ACPs

GPs were unsure of when to initiate such discussion with regards to diagnoses, as patients and their families require time to understand and come to terms with their illnesses[2]. Differences amongst GPs also occurred when defining ACPs, as GPs in rural and urban regions had divergent opinions and understanding of the process itself[16].

Barriers for ACP Implementation

Studies found that previous experiences with ACPs and EOL care improved the skills of GPs and thus facilitated discussions[3]. However,

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De Vleminck et al (2013) found that younger GPs were more likely to initiate discussions compared to older and more experienced physicians. Therefore, future studies are needed to determine the influence of years of experience on ACP employment.

There were contradictory findings regarding the length of patient/physician relationship and the ease of ACP discussions. Having a stronger relationship with the physician allows patients to feel comfortable when discussing such topics;[2,14,17,24] however, it was suggested that having such a relationship with patients may actually hinder GPs' tendencies to participate in such discussions, due to the emotional impact it causes them.[1] Nonetheless, GPs had no concern that having such discussions with their patients would ruin their relationship.[24] Thus, obtaining further information regarding patient-physician relationship dynamics and the ease of implementing ACPs is needed.

Results regarding interprofessional teams and ACPs also varied. Some studies found that involving other health professionals facilitated EOL discussions, as they specified treatments available that GPs may be unaware of.[2,24] While others discovered that other health professionals lacked role understanding, which resulted in inadequate communication between team members, and ultimately hindered the overall process.[3,16]

Direct comparison of these studies is difficult, as each study used different methodologies. The studies that utilized questionnaires had developed their questionnaires in a distinct manner and had included diverse questions. The sample sizes of 8 of the 14 studies was small, and, thus, the findings may not be applicable on a larger scale. As participation in all studies was voluntary, it is uncertain if the findings are truly representative of the greater population. Similarly, the process of data collection could introduce biases, as many of the surveys and interview questions were not validated or provided in the articles themselves. Also, the studies included in the analysis were not conducted in a similar manner, thus results obtained could differ amongst the studies themselves. Additionally, only full free texts were included in this review, which does not represent all of the data available. Furthermore, as only one individual evaluated each of the papers in this review, the chance of error in interpretation is not fully removed.

The studies involved did not restrict their use of ACPs to a certain group of illnesses and can be applicable to ACP implementation for a wider array of diseases and health conditions. Likewise, GPs from diverse regions were incorporated into the studies, suggesting that the findings can be applied on a larger scale. Additionally, many of the studies had one lead researcher transcribing and encoding the data, which eliminates biases regarding data analysis.

Conclusion

It has been suggested that ACPs should be completed by patients' GPs, as they play a central role in the care of patients, yet numerous barriers regarding its completion in clinical practice have been revealed. Lack of knowledge and time, and the fear of provoking anxiety in patients were all found to be potential barriers. There is a lack of data assessing the understanding and knowledge of Irish GPs regarding ACPs, as the Irish healthcare system greatly differs from the studies explored in this review. There is however, an increased need to effectively understand the potential barriers and knowledge of Irish GPs, as ACPs will be incorporated into clinical practices in Ireland through the Assisted Decision Making (Capacity) Act 2015 in the near future.

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Author Contributions

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Supplementary Materials

Table 2. Critical Appraisal Skills Programme (CASP) Qualitative Checklist Assessing 13 Studies with a Qualitative Approach

Reference	Boyd et al. (2010)	Minto F., and Strickland K (2011)	Rhee J.J., Zwar N. A., and Kemp L. A. (2013)	De Vleminck et al. (2014)	Hajizadeh N., Uhler L.M., and Perez Figueroa R.E. (2014)	You et al. (2015)	Brazil et al. (2015)	Fletcher et al. (2016)	De Vleminck et al. (2016)	Fan E., and Rhee J.J. (2017)	Howard et al. (2018)	Scholten et al. (2018)	Wichmann et al. (2018)
Clear statement of aims?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Methods appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Research design appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recruitment strategy appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data collection appropriate?	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Relationship bias minimized?	Unknown	No	Yes	Yes	Unknown	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ethical?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sufficient data analysis?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clear statement of findings?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Valuable findings?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3. Critical Appraisal Skills Programme (CASP) Systematic Reviews Checklist Assessing Two (2) Studies with a Systematic Review Approach.

Reference	Clearly focused question?	Right papers?	All relevant studies included?	Quality of included studies?	Result combination reasonable?	Overall results?	Precision of results?	Application of results?	Important outcomes considered?	Benefits vs. harms?
De Vleminck et al. (2013	Yes	Yes	Yes	U	No	Yes	Yes	Yes	Yes	Yes
De Vleminck et al. (2016)	Yes	Yes	Yes	U	Yes	Yes	Yes	Yes	Yes	Yes

Table 4. Summary of Studies Included in the Review.

Author, (Year), Location, Title	Objective(s)	Study Design, Sample Size	Key Findings (relevant to current study)	Strengths	Limitations
Boyd et al. (2010) Scotland, UK Advance care planning for cancer patients in primary care: a feasibility study[12]	To assess the feasibility of implementing ACP in general practice	Mixed methods (including semi-structured Interviews and telephone interviews) 20 GPs and 8 community nurses N=32	• Younger doctors had no experience of ACPs compared to older doctors • GPs keen to undergo training regarding EOL discussions • GPs considered experience with ACPs more beneficial than knowledge about ACPs Barriers for ACP discussions: • Fear of destroying coping strategies and eliciting fear in patients • Unclear understanding of ACPs • Paper-based documents	• Considered a diverse group of primary care professionals not just solely GPs • Same researcher conducted all interviews	• Workshops discussed slightly different topics • All participants initially had no understanding of ACPs • GPs with experience with oncology only enrolled • Different interview environments as Interviews were conducted at each GPs practice, or over the phone, • Only considered 4 GP practices
Minto F., and Strickland K. (2011) Scotland, UK Anticipating emotion: a qualitative study of advance care planning in the community setting[16]	To explore experiences of GPs and direct nurses involved in EOL care and ACP To find factors that hinder or assist ability to engage in ACP and EOL discussions	Semi-structured interviews 3 GPs and 3 direct nurses N=6	• Mixed results on the impact of GP-patient relationship dynamics and ease of ACP discussions Barriers for ACP discussions • Emotional impact on GP • Inability to meet patient's expectations regarding treatment and EOL care based on the resources available • Availability of equipment was a bigger issue than time constraints and workload • Sense of guilt if unable to deliver care that patient desired • Difficult to support family members	• The same lead researcher transcribed and conducted each interview • Interview recordings were verified and edited by participants to ensure no loss of meaning	• Unknown if having a nurse conduct ACPs would allow for better care due to their relationship dynamics with the patient • Different interview environments as Interviews were conducted at each GPs practice • Small sample size (n=6) • Lead researcher was a clinical nurse specialist which could have led to biases in the results
De Vleminck et al. (2013) Flanders, Belgium Barriers and facilitators for general practitioners to engage in advance care planning: a systematic review[14]	To determine the factors that hinder or facilitate GPs in engaging in ACPs	Systematic review 16 articles	Barriers for ACP discussions: • Unaware of when to initiate discussion + whom to approach • GP's ack of knowledge and skills • Vague requests made by patients • Belief that GPs role is to cure • Fear of upsetting patient • GP's uncertainty of disease trajectories • No initiation by the patient • Patients' knowledge of illness diagnosis/prognosis/trajectory Facilitators for ACP discussions: • GPs having a living will themselves • Attitude that a GP should initiate EOL discussions • Longstanding relationship with patient • Consultation with other HCWs • Younger GPs more likely to initiate discussion • Legal support • Financial compensation for time spent on ACPs	• Articles included came from diverse countries • Considered barriers from the perspective of the physician and the healthcare system itself • Systematic steps conducted twice by two different reviewers	• All studies used different methods thus unable to combine for meta-analysis • Biases in articles chosen and their findings

Author, (Year), Location, Title	Objective(s)	Study Design, Sample Size	Key Findings (relevant to current study)	Strengths	Limitations
Rhee J.J., Zwar N. A., and Kemp L. A. (2013) Australia Why Are Advance Care Planning Decisions Not Implemented? Insights from Interviews with Australian General Practitioners[17]	To determine factors that influence ACP implementation from the GPs perspective	Semi-structured interviews N=17	• Mixed feelings on legal status of ACPs and ease of implementation Barriers for ACP discussions: • Accessibility/ease of ACP documents, especially in after-hours and emergencies • Patients' knowledge of illness diagnosis/prognosis • Patient's being in denial • Patient's family dynamics • Not being able to meet patients' wishes due to over-investigations	• Interviews conducted by the same person • Asked exact same questions • Transcribed by a professional agency • Participants recruited through various manners, thus representative	• Use of open-ended questions makes it difficult to analyse the data • Small sample size • Interview was conducted by a GP (response bias)
De Vleminck et al. (2014) Flanders, Belgium Barriers to advance care planning in cancer, heart failure, and dementia patients: a focus group study on general practitioners' views and experiences[11]	To identify barriers for GPs in initiating ACPs To determine the different barriers for GPs between health conditions	Focus groups N =36	• Many were not familiar with the term ACP • Many GPs had conducted ACPs previously but in an informal manner with no documentation • Previous positive experiences facilitated ACP discussions Barriers for ACP discussions: • Lack of communication between specialists and GPs • Decreased contact between GPs and cancer patients due to transfer of care • GP's knowledge and confidence levels • Lack of time • Uncertainty of when to initiate discussions • GP's personal beliefs • Uncertainty of disease trajectories • No initiation by the patient • Patients' knowledge of illness diagnosis/prognosis/trajectory • Change in preferences by patients over time	• Considered various illnesses (cancer, heart failure, and dementia) and barriers for initiating ACPs individually • Had rural and urban focus groups to determine if any differences were present • Translated by two researchers • Considered barriers from the perspective of the physician and the healthcare system itself	• Focus groups did not consist of equal number of participants • Mainly male and older GPs in study • GPs with experience in palliative care • Changed topic of focus group after the first two groups were completed • Small sample size
Hajizadeh N., Uhler L.M., and Perez Figueroa R.E.. (2014) New York City, USA Understanding patients' and doctors' attitudes about shared decision making for advance care planning[15]	To determine the current use and attitudes regarding shared decision making and ACPs	Semi-structured Interviews 11 Patients and 5 doctors N =11	• Most doctors prefer SDM, yet they ultimately seem to be making the final decision for the patient • Doctors strongly believe that they should be involved and initiate EOL discussions • Doctors believe that ACPs should be conducted in the community and not hospitals, mainly with their GPs Barriers for shared decision making: • Different cultural backgrounds • Language barriers • Lack of patient empowerment • Patients' knowledge of illness diagnosis/prognosis • Lack of time • GP's understanding of illness prognosis	• Interviews were closed-ended questions and easy to quantify • Interviewers were all trained in a similar manner • Transcribed via a constant comparative analysis	• Only 5 doctors were interviewed (small sample size) • Interviews were conducted by different people • Participants were largely white middle-aged males • Difficult to interpret interviews

Author, (Year), Location, Title	**Objective(s)**	**Study Design, Sample Size**	**Key Findings (relevant to current study)**	**Strengths**	**Limitations**
You et al. (2015) Canada (British Columbia, Alberta, Ontario, Manitoba, and Newfoundland and Labrador) Barriers to Goals of Care Discussions with Seriously Ill Hospitalized Patients and Their Families	To determine hospital-based physicians' perspectives about: • Barriers impeding communication and decision-making regarding goals of care with terminally ill patients and their families • Their willingness and acceptability to engage in this process	Cross-sectional Self-administered web and paper questionnaires N=1256	Barriers for ACP discussions: • Patient and family's difficulty in prognosis acceptance • Patients and family's' knowledge of illness diagnosis/ prognosis/trajectory • Lack of agreement amongst families regarding EOL care • Lack of patient's capacity Minor barriers for ACP discussions • Legal concerns • Lack of knowledge and skills • Lack of time	• Survey developed in 3 stages • Both web and paper surveys • Very large sample size • Variety of HCWs enrolled (nurses, residents, and physicians) • 13 hospitals enrolled • 77.7% response rate • Physicians in 5 different provinces enrolled • Questionnaires were specific to each HCWs role • French and English surveys used and translated by bilingual members for accuracy	• Only considers hospital-based clinicians not GPs • Did not consider all hospital HCWs that could possibly take part in ACPs • Response bias • Recall bias • HCWs were all from teaching hospitals
Brazil et al. (2015) Northern Ireland, UK General practitioners' perceptions on advance care planning for patients living with dementia[1]	To determine preferences and attitudes of GPs regarding decision-making for patients with dementia	Cross-sectional posted survey N=133	• GPs require training on discussing ACPs with families • GP's relationship with the patient and their family facilitates discussions Barriers for ACP discussions: • Uncertainty of when to initiate conversation • Uncertainty of disease prognosis • Early discussions triggered anxiety in patients • Lack of family's understanding of therapies and prognosis	• 61% of the surveyed practices provided a response • Mean years of practice was 24.7 years	• Mixed reviews on when EOL discussions should be held • Did not consider how to provide information and understanding to families • Only considered GP practices with registered dementia patients • Responder bias
Fletcher et al. (2016) Western Australia Rural health professionals' experience in implementing advance care planning: a focus group study[2]	To identify the: • Perceptions of HCWs with ACP • Systemic issues regarding ACP • Training needs for ACP	10 focus groups consisting of GPs, GP registrars, and nurses N=55	• Different HCWs have a different understanding of ACPs • ACPs are conducted differently in hospital and community-based practices • Rural and urban GPs have differences in opinion on whether or not to document ACP discussions Barriers for ACP discussions: • Lack of knowledge and confidence • Lack of time • Unable to preserve hope in patients • Complexity of ACPs • No single system on how to develop ACPs • Interprofessional teams and lack of role understanding Facilitators for ACP discussions: • Previous positive experience with ACPs	• Used intra-professional focus groups instead of interprofessional to eliminate power relationships from playing a role • Data analysed by the same researcher	• Only considered rural HCWs • Qualitative study – interpretation methods • Small sample size

Author, (Year), Location, Title	Objective(s)	Study Design, Sample Size	Key Findings (relevant to current study)	Strengths	Limitations
De Vleminck et al. (2016) Brussels, Belgium Development of a complex intervention to support the initiation of advance care planning by general practitioners in patients at risk of deteriorating or dying: a phase 0-1 study[9]	To develop an intervention to support ACP in general practice To identify the barriers and facilitators for GPs to engage in ACPs To identify the attitudes and concerns of GPs regarding initiating ACPs	literature review and focus groups n = 36	Barriers for ACP discussions: • Lack knowledge/confidence • Lack of time • Unsure of components of ACPs • Uncertainty of when to initiate conversation • Worry of creating anxiety or decreasing hope in patients • Uncertainty of disease trajectories • Patients' knowledge of illness diagnosis/prognosis • No central system to document patient's wishes • Inability to determine capacity • Legal implications • Uncertainty about the usefulness of ACPs Facilitators for ACP discussions: • Positive experiences in past • Patient brings up topic • Long-term relationship with patient	• Considered diverse barriers and implemented interventions to overcome • Considered barriers from the perspective of the physician and the healthcare system itself	• Small sample size • Unknown if interventions implemented would be used widely or how feasible they are to implement into everyday practice
Fan E., and Rhee J.J. (2017) New South Wales, UK A self-reported survey on the confidence levels and motivation of New South Wales practice nurses on conducting advance-care planning (ACP) initiatives in the general-practice setting[3]	To understand practice nurses' beliefs, attitudes, and confidence regarding ACPs To identify the potential barriers and challenges regarding ACPs	Online cross-sectional survey N=147	• ACPs should not be solely done by GPs • ACPs should be conducted in the community and not hospitals Barriers for ACP discussions: • Uncertainty of patient's capacity • Lack of funding and time • Uncertainty if wishes will be met • Uncertainty of disease prognosis and trajectory • Personal discomfort • Patients knowledge of ACPs • Lack of information regarding ACPs for patients Facilitators for ACP discussions: • The Patient-nurse relationship dynamics influence ease of discussion • Perceived knowledge of ACPs correlated with discussion confidence • Training enhances confidence	• Survey was created by a team with expertise in ACP and palliative care, that consisted of GPs and registered nurses • 82% completion rate of survey	• Most nurses were female • Mainly consisted of rural nurses • Actual knowledge about ACPs was not tested • Responder bias
Howard et al. (2018) Canada (Ontario, Alberta, and British Columbia) Barriers to and Enablers of advance care planning with patients in primary care: survey of health care providers[18]	To identify barriers to and enablers of ACP perceived by physicians and other primary health care professionals	Cross-sectional Self-administered survey 117 GPs and 64 other HCWs N=181	• Perception that it is the GPs job to cure patients, that patients should initiate discussions were not barriers • GPs had no fear that discussing ACPs would interfere with their relationship with the patient Barriers for ACP discussions: • Lack of time • No electronic ACPs • Decreased interaction with patients near EOL • Patients' knowledge of illness diagnosis/prognosis/trajectory Facilitators for ACP discussions: • Long-term patient-physician relationship • Interprofessional role allocation regarding ACPs	• Survey originated from previous validated study and further developed on by GPs and HCWS • Open-ended questions included at the end of the questionnaire • 2 analysts coded all comments made • GPS in 3 different provinces enrolled • Large sample size (n=181)	• Considered patients older than 50 • Responder bias

Author, (Year), Location, Title	**Objective(s)**	**Study Design, Sample Size**	**Key Findings (relevant to current study)**	**Strengths**	**Limitations**
Scholten et al. (2018) Flanders, Belgium Advance Directive: Does the GP Know and Addresses What the Patient Wants? Advance Directive in Primary Care[19]	To determine what barriers GPs and patients identify regarding ACP discussions	Cross-sectional 502 citizens and 117 GPs N = 619	• Most GPs make less than 5 ACPs a year • Individuals like to be in control of ACPs and initiate discussions Barriers for ACP discussions: • Lack of time • Lack of experience and knowledge • Complexity of ACP documents • Personal discomfort	• Large sample size • Considered well individuals not terminally ill • Citizens were over the age of 64, which is younger than similar previous studies conducted	• Not a validated survey • Responder bias • Survey only provided in Dutch
Wichmann et al. (2018) Netherlands Advance care planning conversations with palliative patients: looking through the GP's eyes	To determine GPs experiences with ACP discussions and the factors influencing these discussions	Semi-structured interviews N=17	• Mixed results regarding utilization of ACP guidelines • Easier to implement ACPs for cancer patients than other types of patients Barriers for ACP discussions: • Difficult topic to bring up • Emotional impact on GP • Lack of time • Uncertainty of when to initiate conversation, especially if patients still being treated in the hospital • Anxious patients • GPs personal beliefs conflict with patients • Lack of communication between GPs and specialists	• Transcribed via an official agency • Constant comparative method used for data analysis • Participants had strong knowledge regarding ACPs	• GPs were recruited from an ACP training program, thus not representative of the wider population • Different interview methods used (face-to-face, or telephone) • Interviews conducted in Dutch • Various interview locations could cause confounders • Small sample size • Use of open-ended questions makes it difficult to analyse the results

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Review

A Pan-Canadian Narrative Review on the Protocols for COVID-19 and Canadian Emergency Departments

Sebastian Diebel,[1] Eve Boissonneault.[1]

Abstract

First described in Wuhan, China, in December 2019, the World Health Organization declared the novel coronavirus disease (COVID-19) a global pandemic on March 11th, 2020. Canada identified its first positive COVID-19 patient on January 25th, 2020. The Canadian government and heath care system immediately started discussing how best to respond to this pandemic. It was hypothesized that potentially positive and confirmed positive COVID-19 patients would present to emergency departments across the country. It has now been over a year since the first positive patient was identified in Canada, and there has yet to be a narrative review that explores how Canadian emergency departments have responded to the novel COVID-19 virus. This narrative review will discuss measures that were taken thus far, including pre-hospital care, the use and implementation of virtual care, the importance of simulation training, protocols regarding patient screening at presentation to the emergency department, the use of personal protective equipment, and lastly, rural emergency department response. This narrative review may be beneficial as the COVID-19 pandemic continues, by providing a concise summary of measures that were taken in various emergency departments across Canada to prevent the spread of the virus.

Key Words: COVID-19; Canada; Emergency Departments; Pre-hospital care (Source: MeSH-NLM).

Introduction

On March 11th, 2020, the World Health Organization (WHO) declared the novel coronavirus disease 2019 (COVID-19) a global health pandemic.[1] The disease was first described and identified in Wuhan, China in December 2019, and it is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[2] The COVID-19 virus appears to have developed precipitously as data from October 10th, 2020, (approximately 7-months following the declaration from the WHO of a global pandemic) indicated that the virus had spread to over 200 countries and territories infecting 35 million people, which resulted in approximately 1-million deaths globally.[2]

In Canada, the first individual diagnosed with the COVID-19 virus was detected on January 25th, 2020.[3] Cases then started spreading rapidly and began appearing in most provinces and territories. As a result, the Government of Canada decided to impose travel restrictions, and as of March 14th, 2020, only allowing Canadian Citizens, permanent residents, and citizens of the United-States to cross the Canadian border.[3] The Canadian health care system hypothesized that patients with suspected COVID-19 or worsening symptoms from confirmed cases would present to the emergency departments or outpatient departments/clinics, and therefore, it was imperative that these departments have protocols in place to safely triage these patients.[3]

As patients often assume that hospital emergency departments are the best places to be assessed for COVID-19, the primary goal of this narrative review is to highlight some of the key measures and protocols taken by Canadian emergency departments in preparation for receiving patients with COVID-19, knowing that emergency departments may be the first point of contact for these patients.[4] Highlighting these measures has both intrinsic and extrinsic value. Intrinsically, it may be beneficial to have a narrative that highlights and summarizes the measures that were taken in Canada. This article could also aide emergency departments across Canada by streamlining the review process of COVID-19 safety protocols that were implemented by various departments during the pandemic, making these safety protocols easily reproducible if needed.

The extrinsic benefit being that this narrative may generate ideas for healthcare practitioners in other regions of the world, particularly if these interventions are later found to be effective. Lastly, if another pandemic occurs, the strategies utilized that are brought forward in this narrative review may be beneficial - similar to how the SARS pandemic strategies are being applied to the current COVID-19 pandemic.[5]

Methods

A widespread literature search was conducted using the PubMed database and Google Scholar for articles that were related to COVID-19 and Canada. The literature search was conducted between the months of January and February 2021. During the search, key words were used including ¨COVID-19,¨ ¨SARS-CoV-2,¨ ¨Canada,¨ ¨Emergency Department,¨ and ¨Screening.¨ Studies published in English with text that were made fully available via the university login were screened for utilization. As it was important in this review to explain some of the history of the COVID-19 Pandemic, a minute amount of the manuscript contains articles that were published using key words such as ¨COVID-19,¨ and ¨History.¨ However, for the remainder of the narrative review articles published in 2020 or sooner were considered for use. The original search results revealed 142 records. Two authors then screened the studies to ensure that they were relevant to the narrative review and to ensure that there were no duplicates. Studies extracted from the search for this review included: exploratory multiple case studies, commentaries, differential equation analysis, and government reports.

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As the response to COVID-19 in the context of emergency departments in Canada has not been extensively studied yet, there was not a lot of large multi centers available. Following the screening, the authors identified 19 articles that were relevant and included. They are summarized in ***Table 1*** below.

Additionally, the scale for the quality assessment of narrative review articles (SANRA) instrument was considered and utilized during the preparation of this narrative review.

Table 1. Summary of articles included in the narrative review.

Authors	Country (Province)	Study Design	Study Period
World Health Organization	Global	Statement from WHO declaring global pandemic	Not applicable
Brondani et al.,	Canada	Narrative Review	April-July, 2020
Scarabel et al.,	Canada	Model-free Estimation	January-March, 2021
Lin et al.,	Ontario, Canada	Data Analysis of COVID-19 rates in Hospitals	January 20th – February 19th, 2020
Devine	Canada	Retrospective Analysis	February 2020
Glauser	Canada	Proposed Protocol to keep COVID-19 out of Hospitals	March, 2020
Reece et al.,	Alberta, Canada	Simulation Training with Quantitative Analysis	April-July, 2020
Rosenfield	Canada	Literature Review	July – August, 2020
Brittain et al.,	British-Columbia, Canada	Commentary	2020
Chaplin et al.,	Canada	Commentary	September, 2020
Marchand-Senécal et al.,	Canada	Case-Study	November, 2020
Harris et al.,	Nova-Scotia, Canada	Educational Model	June, 2020
Ravani et al., 2020	Alberta, Canada	Prospective Quality-Improvement Study	April-May, 2020
COVID-19 Patient Screening Guidance Document	Ontario, Canada	Ministry of Health COVID-19 Patient Screening Guidance Document	June 11th, 2020
Eckbo et al.,	British-Columbia, Canada	Clinical Evaluation	June, 2020
Savage et al.,	Ontario, Canada	Differential Equation Analysis	September, 2020
Walsh et al.,	Ontario, Canada	Case Study	December, 2020
Fleet et al.,	Quebec, Canada	Exploratory Multiple Case Study	January, 2020
National Ambulatory Care Reporting System, 2018–2019 to 2020–2021 (open-year data), Canadian Institute for Health Information.	Canada	Report	March-June, 2020

Discussion

Virtual Care Received Prior to Emergency Department Presentation

Early-on during the COVID-19 pandemic in Canada, most people who were infected or had COVID-19 symptoms were instructed to present to the nearest emergency department.[6] However, it was originally proposed that people suspected to have COVID-19 would be evaluated, swabbed, and examined in their homes by paramedics who had received special training and appropriate protective equipment to conduct these home evaluations.[6] A good example of this home and virtual care delivery method was conducted in the province of British Columbia, specifically with the British Columbia Emergency Health Service (BCEHS). The BCEHS is the primary out of hospital health service for the province of British Columbia.[7] Prior to the COVID-19 pandemic, the BCEHS had already cultivated therapeutic relationships with approximately 99 rural and remote communities within the province, that had limited access to healthcare.[7] BCEHS was effectively providing virtual care for patients in these rural communities before the pandemic and continued to do so throughout. Additionally, BCEHS saw an increase in the number of home-visit requests.[7] This strategy was originally proposed and utilized in order to limit the number of individuals presenting to the emergency departments for healthcare issues that could be managed appropriately and effectively at home, attempting to prevent the spread of the COVID-19 virus.[6]

Looking beyond paramedic services, some children's hospitals also implemented emergency department services via a virtual platform.[8] Using a virtual platform consisted of providing pediatric patients with virtual same-day or next-day appointments for families at home seeking medical care but not wanting to risk being exposed or exposing others. The design of this new virtual platform also served as a template for other hospitals that wished to begin providing similar virtual care to patients. In order for these virtual platforms to be effective, emphasis needed to be placed on ensuring patient safety by: (1) instructing acutely ill or unstable patients to physically present to the emergency department, (2) by having qualified physicians available, and (3) by having access to user friendly technology for both the healthcare providers and the patients.

Although the impacts of the COVID-19 pandemic have not been fully explored or established, this strategy of home visits and delegating virtual visits to paramedics that are trained in community paramedicine may have been beneficial in keeping people at home and away from emergency departments, thus limiting the spread of COVID-19 amongst the remainder of the population.[9] Additionally, it was hypothesized that these measures would save resources including personal protective equipment. It was believed that this would be an effective strategy as some evidence suggested that during the SARS pandemic, healthcare institutions in Canada acted as vectors involved in propagating the disease.[6]

Although it was suggested that pre-hospital and virtual visits would be an effective healthcare delivery method, it was inevitable that individuals who were asymptomatic or symptomatic would eventually present to the emergency department. As such, it is important to discuss the preparation that emergency departments took to ensure the safety of patients and hospital staff in attempting to prevent the spread of the COVID-19 virus.

Simulation Training

While the benefit of simulation training in the emergency department was believed to be of utmost importance in training hospital staff, it was also known that there would be some variations based off of local needs.[10] However, there were some common themes that were identified early on in various emergency departments in Canada that included: (1) protocol development and system testing, (2) healthcare provider education, and (3) team-based training. The protocol development included the creation of novel pandemic-related protocols that were then utilized in simulations. An example of a new COVID-19 related protocol was one that involved an intubation checklist.[10] This was particularly important as airway interventions such as intubations, are aerosol-generating procedures thus needed to be reconsidered and evaluated for their safety, as these procedures are commonly performed yet high-risk for exposure to the CVOID-19 virus.[11] Additionally, the importance of team-based training and taking an interdisciplinary approach was highlighted. For example, it was believed that the intubation checklist protocol would be more effective and valuable if several members of the healthcare team could understand and implement it, rather than one team member being solely responsible.[12]

Patient Screening Upon Presentation to the Emergency Department

Screening healthy individuals for COVID-19 in Canadian emergency departments has demonstrated limited evidence.[13] For example, the Ontario Ministry of Health provided emergency departments with a COVID-19 patient screening document that was created based off of the COVID-19 case definitions and situation reports that were published by the WHO. Typically, patients that presented to the emergency department were asked questions that provided a rapid screen for COVID-19. Screening questions enquired about foreign travel in the last 14-days, confirmed positive COVID-19 tests, symptoms such as fever, cough, and other symptoms that have been described in people infected with the COVID-19 virus.[13] The screener would then follow the screening questionnaire to determine if a patient possessed either a negative COVID-19 screen or a positive screen.[14] This system allowed the healthcare practitioners to take the proper precautions necessary in the emergency department in an attempt to ensure safety for patients and staff.[14] In select emergency departments, anyone presenting to the emergency department was also tested for COVID-19 using nasopharyngeal or oropharyngeal swab samples.[15] Although this protocol was implemented, its purpose was to evaluate the accuracy of nasopharyngeal and oropharyngeal swabs in COVID-19 detection, as opposed to the actual management of patients in the emergency department.[15]

Personal Protective Equipment and Precautions

In order to keep patients and staff safe and to reduce the spread of COVID-19, there was an acute demand globally in the amount of personal protective equipment (PPE) needed. Protocols were designed accordingly in order to preserve as much PPE as possible.[16] If a patient was suspected of having COVID-19 symptoms and was being investigated in the emergency department, proper PPE was required before entering this patient's room. During the diagnosis of the first case of COVID-19 in Canada, PPE consisted of: (1) a long-sleeved gown, (2) gloves, (3) an N-95 respirator mask that had been properly fitted, and (4) a face shield for eye protection.[16] Patient encounters were conducted by regular emergency department staff members including screeners, nurses, physicians and phlebotomists.

At the beginning of the pandemic in Ontario, January 23rd, 2020, further recommendations emphasised the use of N-95 respirators in addition to droplet precautions and airborne isolation rooms for patients that were being investigated for the COVID-19 virus. These precautions were deemed mandatory based off of previous information that Canada had acquired during the SARS epidemic in the year 2003.[4]

When reviewing the PPE that was used early in the pandemic within emergency departments, it is of note that this type of equipment and the precautions taken may not have been easily accessible in most outpatient clinics.[4] This lack of PPE availability prevented suspected COVID-19 patients from being tested in outpatient clinics, thus promoting testing and evaluation to occur in emergency departments. It is also important to note that staff members in emergency departments were trained in donning and doffing PEE appropriately, which may not always be the case in outpatient clinics.

Other precautions that were utilized included limiting the amount of healthcare workers that came in contact with patients suspected of having the virus. Additionally, all healthcare workers who were in contact with suspected COVID-19 patients were logged, in order to keep an accurate record of potential exposures. Equipment that was needed for examining suspected patients such as blood pressure cuffs, thermometers, otoscopes, and stethoscopes were solely used for the patient under investigation and was not used for any other patient. Lastly, in an attempt to limit the amount of traffic in and out of exam rooms, patients were not allowed to have visitors.[6]

Once patients were discharged and left their room, cleaning of these rooms was done using 0.5% hydrogen peroxide. The rooms were cleaned twice, and an infection prevention and control professional audited the room cleanings to ensure thoroughness.[16]

Emergency Departments in a Rural Context

Depending on the definition that is used, approximately 19-30 percent of Canadians live in a rural setting.[7] It has been chronically documented that Canadians who live in a rural setting face disproportionate health burdens and needs.[17] The specific needs of rural emergency departments in Canada may vary between provinces and territories however, most are faced with similar challenges. Examples of the challenges face by rural communities include but are not limited to, access to primary healthcare services, lower income, unhealthy lifestyles, less education, isolation and higher mortality rates. Rural emergency departments are faced with the difficult and complex task of providing accessible and quality care for these communities while being distant from larger referral centers. Unfortunately, these isolated rural departments struggle with recruiting and retaining staff, and often have limited access to medical equipment and resources needed to provide comprehensive care in rural communities.[18] As a result, it had been suggested that rural populations would face a disproportionate amount of disadvantages with COVID-19, versus Canadians living in urban settings.[17] This was largely attributed to the fact that rural Canadians generally have worse health status, leading to an increase in Intensive Care Unit (ICU) admissions and increase mortality compared to urban populations.[17] An example of the protocols developed by a Canadian rural emergency department during the COVID-19 pandemic are outlined below.

Located in the rural region of Greater Napanee, Ontario, the Lennox and Addington County General Hospital (LACGH) took the following measures in an attempt to keep the COVID-19 cases at bay.[17]The first approach that was taken by this rural hospital was the establishment of an incident command team. The command team originally met daily to exchange ideas and come up with solutions to prevent the spread of COVID-19 in the emergency department and hospital.[17] This team consisted of various employees including the chief of staff, nursing officer, and frontline workers.

The LACGH decided that it would close all doorways to the public with the exception of the emergency department doors. They also decided to post signs in the parking lot stating that people should only proceed if they were experiencing a ¨serious medical emergency. ¨ Lastly, they ensured that the emergency department was adequately supplied with PPE for staff.

Other changes included protocols for registering and triaging patients safely, and even providing care via telephone whenever possible. Physically, a negative pressure room served as a resuscitation room so that airway management (if need be) could be conducted as safely as possible. Lastly, a dedicated Code Blue team was established for possible COVID-19 cases and the team participated in frequent simulations and debriefs.

Limitations

As this is a narrative review, it possesses limitations that are typical for this type of article (i.e., does not answer a specific quantitative research question). However, the SANRA tool was utilized to ensure that proper rigor for a narrative review was maintained. When assessing the specific limitations of this narrative review the most important thing to consider is that during the writing of this article the COVID-19 global pandemic is ongoing. As a result, it is not possible to evaluate the interventions that have been mentioned and their efficacy (i.e., did these interventions and measures work) in the context of emergency departments in Canada. However, once studies evaluate these interventions it may be ideal to complete a follow-up or additional narrative review.

General Summary

After having conducted this review, the authors have not been able to find a narrative review that details the response and reaction of Canadian emergency departments to the COVID-19 pandemic. The purpose of this narrative review was to outline the pan-Canadian steps undertaken in emergency departments across Canada during the first year of the COVID-19 pandemic. Literature suggest that the initial strategy was to include home and virtual visits for patients that may have had symptoms, however, were not critically ill enough to seek care from an emergency department or tertiary center.

Of note, there was a movement in the pandemic's infancy attempting to steer patients away from the emergency department, while not sacrificing the care of patients in need. The initial fear was that overcrowded emergency departments would act as vectors, spreading the virus and endangering patients and staff. People were urged to stay at home and limit their contact with others by governments across Canada, while health care professionals limited patient encounters to urgent and needed treatments.[19] The Canadian Institute for Health Information released information regarding changes in emergency department visit numbers from early in the pandemic. The stay-at-home orders from the Canadian government seemed to be effective as rates of emergency department visits in Canada started to decline in March 2020, reaching a low of 50% compared to March 2019. The rates slowly started to climb but were still low at 85% in June, months after the start of the pandemic. Fewer people sought care for common concerns such as abdominal care and even more serious concerns like cardiac events and traumas. Unfortunately, the potential consequences of emergency department avoidance by patients are not known as per The Canadian Institute for Health Information.[19]

However, emergency departments understood that symptomatic patients would inevitably present for care. In preparation for this influx of COVID-19 patients, emergency department staff prepared themselves by participating in several simulation sessions. These simulations identified strengths and weaknesses within the department, which lead to protocol development, healthcare provider education, and emphasized the importance of a team-based approach.[13,14] These developments lead to better patient care while ensuring constant safety.

Once patients did present to the emergency department, they were screened prior to entering. Patient screening was useful in identifying those that were high risk for COVID-19. Screeners asked patients questions related to travel and asked if they had been experiencing any symptoms. This allowed healthcare practitioners to take necessary precautions while assessing these patients.[13,14] Such precautions involved the use of appropriate PPE, limiting the number of contacts that a suspected COVID-19 patient had, and appropriate cleaning of patient rooms once the patient had been discharged from the emergency department.[16]

Canada has a large percentage of its citizens living in rural settings making it important for the emergency departments serving these rural regions to be prepared and have appropriate protocols in place to assess COVID-19 patients, as rural populations are more vulnerable than their non-rural counterparts. These protocols included having a single door for access to the entire hospital via the emergency department, actively encouraging community members to avoid emergency departments for non-urgent services, creating an incident command team, and having a dedicated code blue team.[17]

It will be interesting to reflect on the various interventions that were implemented across Canadian emergency department and to evaluate their effectiveness following the fruition of the COVID-19 pandemic. Intrinsically, there may be lessons to be learned from the response within Canada. Extrinsically, there may be takeaways that other areas with similar infrastructure and populations (i.e., rural) may consider implementing.

Conclusion

The protocols designed and utilized by various Canadian emergency departments are important to document and analyze despite not yet knowing the full scope of their effectiveness, as they could be the foundation for future research and could be beneficial if a similar situation manifested in the future.

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Case Report

Spinal Cord Injury Induced Osteoporosis: Case Report and Current Literature

Abdulai Bangura,[1] Thomas Shuler,[2] Lisa Wright,[3] Anne Lake.[4]

Abstract

Background: Among the various etiologies of osteoporosis, spinal cord injury has a drastic progression of the disease, causing weekly bone loss. There is no definitive treatment for the prevention of osteoporosis in these individuals. This review illustrates the recent findings on the pathophysiology, treatment, and management of spinal cord injury-induced osteoporosis. Furthermore, we cover a case of a male patient who experienced severe bone loss after a spinal cord injury at the age of 21 years. **The Case:** We have a 57-year-old man with a history of AIS grade A spinal cord injury, level T11 with rod fixation from a motorcycle collision at age 21. His fracture history following the injury includes tibia, femur, and vertebral fractures. Bone mineral density imaging revealed notable T-scores ranging from -3.1 to -3.4 at the hip and femurs. Treatment plan consisted of teriparatide, dietary supplements, and physical therapy. Biomarkers from baseline to post one month of treatment revealed the following: procollagen type 1 N-terminal propeptide from 38 mcg/L to 70 mcg/L and C-terminal telopeptide from 209 pg/mL to 88 pg/mL, representing an increased bone formation and decreased bone resorption, respectively. After two years, bone mineral density T-scores improved to -2.7 on the left and the patient was capable of standing for the first time with the assistance of a standing frame. **Conclusion:** Our case exemplified the progression of the disease and treatment options. A basis for the derivation of future innovative therapies has been covered. Favorable treatments and management are described in the review.

Key Words: Spinal Cord Injuries; Osteoporosis; Teriparatide; Bone Density; SOST protein; human (Source: MeSH-NLM).

Introduction

Among the various etiologies of osteoporosis, spinal cord injury (SCI) has a drastic progression of the disease, causing weekly bone loss. This is due to a multifactorial and unfavorable set of consequences involving bone metabolism.[1] Following bone peak mass at 30 years of age, men and women lose bone mineral density (BMD) at a rate of 0.3% and 0.5% per year, respectively. Post-menopausal women lose BMD at a rate of 2% per year.[2] However, individuals with SCI lose 1% of BMD per week.[1] Due to the significant amount of bone loss leading to osteoporotic fractures, individuals with SCI are at an increased risk for comorbidities including osteomyelitis, skin pressure ulcers from bracing and bedrest, and hypertensive crisis from autonomic dysreflexia.[3,4] The National Spinal Cord Injury Statistical Center (NSCISC) reports an incidence of 17,810 new SCI cases in the United States each year with a current prevalence that could reach 368,000 people. According to the NSCISC data sheets, both the incidence and prevalence have increased over the last couple years with the most common cause being motor vehicle accidents. Additional common causes are acts of violence (primarily gunshot wounds) and sports/recreational injuries.[5,6] At this time, there is no definitive treatment for the prevention of osteoporosis in these individuals. We hope to establish the current pathophysiology to provide a basis for future innovative therapies.

People with SCI are immediately challenged by the consequences of mechanical unloading, neural denervation with subsequent vascular dysregulation, and biomarker abnormalities. All of which contribute to either increased bone resorption, decreased bone formation, or a combination of two. Mechanical unloading is noteworthy as it leads to a cascade of events that is expected to have the strongest association with bone loss.[3]

Highlights:

- The most recent findings on the pathophysiology, treatment, and management of spinal cord injury induced osteoporosis.
- A basis for the derivation of future innovative therapies for spinal cord injury induced osteoporosis.
- Favorable treatments and management for best prognosis in spinal cord injury induced osteoporosis.

In both human and animal studies, a decrease of mechanical loading on bone has been found to have a significant association with an increase in sclerostin protein synthesis and vice-versa.[7,8] Sclerostin is encoded by the sclerostin gene (SOST) and it is expressed by many tissues, but primarily by osteocytes. Most recent literature has recognized sclerostin as the principal mediator of SCI osteoporosis.[3] Sclerostin inhibits the Wnt/β-catenin pathway, which is a vital component of bone formation.[9] Furthermore, sclerostin increases the expression of receptor activator of nuclear factor kappa-B ligand (RANKL) and decreases the expression of receptor activity of osteoprotegerin (OPG) which ultimately increases bone resorption.[10]

Due to sclerostin's strong correlation with mechanical unloading, it is a great contributor to SCI osteoporosis. Sclerostin demonstrates an inverse relationship with BMD within the first 5 years following SCI, with sclerostin levels increasing as BMD decreases. After 5 years, the relationship reverses into a positive relationship with sclerostin levels

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now decreasing as BMD levels continue to decrease.[11] One study sampled men with chronic SCI (2+ years post injury) and as the number of years following the SCI increased, the levels of sclerostin and BMD decreased together. It is important to note that the duration of injury for the subjects ranged from 4.1 to 42.6 years. Their findings suggested that circulating sclerostin levels in chronic SCI is a potential indicator of osteoporosis severity.[12]

Although mechanical unloading appears to be the point of attention, other factors impact SCI osteoporosis. As expected, there would be neural damage which reduces bone function. Sympathetic stimulation contributes to bone maintenance and it has been found that sympathetic denervation of bone in animal models revealed increased bone resorption and decreased bone mineralization. Furthermore, sympathetic denervation causes subsequent vascular dysregulation. The impairment of vascular regulation allows increased capillary and venous blood pooling which leads to increased intraluminal pressure. A potential consequence of local blood pooling is osteoclast formation.[4] For these reasons, sympathetic denervation and subsequent vascular dysregulation are potential contributors to osteoporosis in individuals with SCI.

In addition to mechanical unloading and sympathetic denervation, biomarkers including vitamin D, parathyroid hormone (PTH), and fat, contribute to osteoporosis in individuals with SCI. Although the prevalence of vitamin D deficiency is high among the general population, people with SCI are still at an increased risk for vitamin D insufficiency or deficiency.[13] In regards to PTH, the high activity of bone resorption following SCI induces hypercalcemia leading to the suppression of PTH synthesis.[14] PTH has been found to suppress sclerostin levels in human and animal studies.[15,16] Therefore, a decrease in PTH can subsequently lead to further bone loss by increasing sclerostin levels. Fat has also been found to affect bone maintenance in SCI individuals. Multiple studies have revealed that people with SCI have a greater percentage of body fat in comparison with matched age and sex controls, demonstrating a greater risk of obesity in people with SCI than in the general population.[3]

It is established that fat has an osteoprotective effect on bone by way of increased mechanical loading which induces bone formation.[17] However, with SCI, muscle paralysis prevents mechanical loading and may disrupt this process. In addition, fat releases leptin which mainly regulates appetite and energy expenditure in the hypothalamus.[18] Leptin also has additional properties including bone formation regulation. Leptin can provide sympathetic inhibition to osteoblasts and suppress bone formation by way of beta-2-adrenergic receptors on the osteoblast cell surface.[3] Leptin levels have been shown to be elevated in individuals with SCI in comparison with the general population.[19] Adiponectin is a hormone that is produced by adipocytes or fat cells. In both human and animal studies, increased levels of adiponectin have been associated with increased bone loss.[3] One study revealed that adiponectin has an inverse relationship with BMD in individuals with chronic SCI. The same study revealed that when these individuals participated in walking activities, the inverse relationship was no longer found.[20] However, research of the relationship between adiponectin and bone loss specifically in the SCI population is currently ongoing. Therefore, a deficiency of vitamin D or PTH, and an accumulation of fat could all potentially contribute to osteoporosis in individuals with SCI.

We present a case of a male patient who experienced severe bone loss after a SCI at the age of 21 years and review the literature to discuss treatment options.

The Case

History

A 57-year-old man with a history of level T11, AIS grade A SCI with rod fixation from a motorcycle accident at age 21 was referred to our fracture liaison and bone health clinic for a bone health evaluation. The patient himself provided consent for his information to be included in publications. He is 5'10" with a body mass index (BMI) of 23.8. He has a 7.5 pack-years smoking history with cessation of smoking in 2015. His fracture history following the SCI included right tibia fracture, right femur fracture, and left femur fracture all of which were associated with the mechanical attempts of standing and therapy. There is no record of his treatment plan or laboratory results prior to his first visit at our bone health clinic.

Investigation

Physical examination was consistent with a T11 level paraplegia with anesthesia at the T12 dermatome and motor examination with flaccid lower extremity paralysis, and 2+ distal pulses. The left lower extremity had a slight knee contracture of 5 to 10 degrees. Bone density imaging referenced severe osteoporosis in the total hip and femoral neck bilaterally (***Table 1***). BMD imaging revealed the following notable T-scores: right hip and right femoral neck [T-score -3.1], left hip and left femoral neck [T-score -3.4]. However, it is important to note that optimal leg positioning for BMD imaging was not achieved due to the patient's limitations. Furthermore, radiological imaging represented diffuse bony demineralization of the left femur (***Figure 1***). Laboratory orders were ascertained for a baseline which included bone biomarkers for comparing with post treatment evaluations (***Table 2***).

Table 1. Bone density imaging referenced severe osteoporosis in the total hip and femoral neck bilaterally.

Component	Value	Comment
BMD Spine (L1-L4)	1.282	Could only scan L3-L4 due to hardware in L1-L2
T-Score Spine (L1-L4)	0.4	
Z-Score Spine (L1-L4)	0.7	
BMD Right Hip	0.671	
T-Score Right Hip	-3.1	Osteoporosis
Z-Score Right Hip	-2.2	
BMD Left Hip	0.622	
T-Score Left Hip	-3.4	Osteoporosis
Z-Score Left Hip	-2.6	
BMD Mean Hip	0.674	Unable to position legs optimally for scanning
T- Score Mean Hip	-3.3	osteoporosis
Z-Score Mean Hip	-2.4	
BMD Right Femoral Neck	0.671	
T-Score Right Femoral Neck	-3.1	osteoporosis
Z-Score Right Femoral Neck	-2.2	
BMD Left Femoral Neck	0.622	
T-Score Left Femoral Neck	-3.4	osteoporosis
Z-Score Left Femoral Neck	-2.6	

Table 2. Baseline and post-therapy biomarkers.

Lab	Reference range	Baseline	1 month
P1NP	30-110 mcg/L	38 mcg/L	70 mcg/L
Vitamin D	30-100 ng/mL	26 ng/mL	50 ng/mL
Alk Phos Bone	7.6-14.9 mcg/L	12.1 mcg/L	
CTX	87-345 pg/mL	209 pg/mL	88 pg/mL
PTH	18.4-88.0 pg/mL	52.8 pg/mL	
Phosphorous	2.5-4.6 mg/dL	3.3 mg/dL	
Calcium	8.5-10.7 mg/dL	9.8 mg/dL	10.4 mg/dL
Creatinine	0.5-1.4 mg/dL	0.46 mg/dL	<0.38 mg/dL
Ionized Calcium	1.13-1.32 mmol/L		1.19 mmol/L

Management

We considered the patient's past history, imaging, and laboratory results to align the following treatment plan: teriparatide [rDNAorigin] injection once daily, vitamin D2 (50,000 iu's) once weekly for 8 weeks, vitamin D3 (2000 iu's) once daily, vitamin K2, and calcium citrate 600 mg once daily. Additional supplements included magnesium citrate and creatine. Treatment medication was chosen based upon the goal of promoting bone formation and synergistically aligning the patient to a standing frame. Treatment decisions were made based upon current available literature and shared decision making between the patient. Outpatient physical therapy was prescribed to promote resistance upper body training to help promote bone growth in addition to his use of teriparatide. The patient was also followed by physical medicine and rehabilitation with which a standing frame was attempted but not achieved. After one year of treatment, care was transferred to another fracture liaison and bone health clinic. At the new site, the patient continued with teriparatide for an additional year, which was then discontinued due to its black box warning. There is a theoretical risk of osteosarcoma when medicating with teriparatide for more than 2 years. Vitamin D3 supplementation was also continued, but at a greater dose, 3000 iu's once daily. While promoting bone formation with biologic measures, the mechanical goal of aligning the patient to a standing frame remained the same.

Figure 1. Left knee x-ray (oblique, externally rotated). Diffuse bony demineralization reduces sensitivity of radiography for acute fracture. There is corticated deformity of the distal femur and proximal tibia from old, healed fractures. No clear evidence of a superimposed acute fracture.

Outcome

Notable biomarkers from baseline to post one month of treatment revealed the following: procollagen-1 N-terminal peptide (P1NP) from 38 mcg/L to 70 mcg/L and C-terminal telopeptide (CTX) 209 pg/mL to 88 pg/mL, representing an increased bone formation and decreased bone resorption, respectively. The patient's symptoms regarding immobility and fracture risk remained the same at that time. After two years of treatment, there was improvement in BMD represented at the left femoral neck [T-score -2.7] and left total hip [T-score -2.7] which both improved from baseline [T-score -3.4] (***Table 1***). Furthermore, the patient was capable of utilizing a standing frame and stood for the first time since before his injury 38 years prior.

Discussion

Our case revealed improvement in osteoporosis labs and physical symptoms during a two-year course of treatment. Once labs and bone density tests have leveled, we would expect them to be at a steady state barring overall health change. We believe the improvement seen in our patient's BMD was supported by prescribing teriparatide, supplementing vitamin D, and utilizing a standing frame. During the time of management, we were not informed of the International Society for Clinical Densitometry (ISCD) guidelines and did not utilize them. This patient could have also been a good candidate to consider the latest technology VirtuOst Stress Test due to the difficulty in patient positioning from his previous bone density imaging. VirtuOst Stress Test is a Food Drug Administration (FDA) cleared virtual stress test that assesses BMD, bone strength, and fracture risk. Bone density does not fully assess bone strength and quality. Factors such as diet, smoking status, alcohol use, are also important associated factors to evaluate in a patient with osteoporosis. In this patient's case, we focused on a weight training program aligned with a physical therapist to promote body strength which over time had weakened in addition to providing mechanical load to the skeleton.

Due to the black box warning on teriparatide, the patient's medication was switched to denosumab, a monoclonal antibody against RANKL. The decision to transition to denosumab was extrapolated from the DATA-switch study.[21] There has since been an update to teriparatide's label, removing the black box warning. The decision to resume teriparatide after two years is determined by clinical decision making and risk-benefit considerations. Given the recent update regarding teriparatide, it is reasonable to evaluate the patient one year after denosumab to determine whether to consider a future return to an anabolic therapy such as teriparatide. It is important to accrue bone mass over time by structuring a sequence of pharmacologic therapy.

If our patient's future progression becomes similar to previous studied cases, then we should expect a cessation in lab and bone density test improvement and minimal or no improvement of symptoms. For these reasons, it is important to illustrate the most recent findings of the pathophysiology, treatment, and management of SCI osteoporosis to reference optimal care and provide a basis for the derivation of future innovative therapies.

Although the pathophysiology of SCI osteoporosis has been distinctly outlined, the treatments' efficacy remains limited.[22]

Current Treatments

An effective long-term treatment for SCI osteoporosis has not been established. Current treatment options include pharmacological and physical therapy interventions. Although there are no interventions which prevent or reverse SCI osteoporosis, bisphosphonates, a group of antiresorptive drugs, are the most common pharmacological treatment for bone loss prevention in these individuals. Unfortunately, bisphosphonates have mostly been shown to be effective within the first year post SCI.[4] Studies have shown a 16.4% to 19.7% reduction in bone loss at the femoral neck and approximately 21% percent reduction in bone loss at the total hip when treating SCI osteoporosis with bisphosphonates within the first year.[23] However, a single study revealed that a two year course of bisphosphonates following SCI reduces the risk of fracture for two years, but revealed no evidence of bone loss prevention following one year.[3] Bisphosphonates aid in the prevention of acute bone loss following SCI, but have no effect on bone formation. Therefore, the effect of bisphosphonates is not substantial. This dilemma has encouraged further investigation for more desirable pharmacological treatments.

Teriparatide (TPDT), a recombinant human parathyroid hormone has recently gained attention as the optimal pharmacological treatment. TPDT is one of the few approved anabolic pharmacological treatments for osteoporosis and can be effective up until 24 months.[24] It has also shown efficacy in treatment of SCI osteoporosis demonstrating a 4.8% to 5.5% increase in spinal BMD from baseline to 12 months. Furthermore, TPDT revealed a 7.1% to 14.4% increase in spinal BMD from baseline to 24 months.[25] Along with these current drug therapies, denosumab, a monoclonal antibody against RANKL has been shown to increase BMD in individuals with SCI induced osteoporosis as well.[26]

As for physical therapy interventions, weight-bearing exercises, functional electrical stimulation (FES), and whole-body vibration (WBV) have been used to improve osteoporosis by increasing BMD.[3,4] As we discussed earlier, sclerostin levels decrease with mechanical loading. Therefore, an increase of bone formation should be expected to follow weight-bearing exercises. Mechanical loading in SCI is a considerable challenge given the immobile state of the person. However, this challenge has been approached with FES exercises. FES treatment achieves mechanical loading by allowing electrodes to stimulate paralyzed muscles and facilitate muscle contraction. FES exercises have not been proven to provide long-term efficacy.

Whole body vibration (WBV) therapy also can achieve mechanical loading via mechanical vibration and is currently a potential treatment for bone formation in SCI. In fact, both human and animal studies have reported neurological function recovery with SCIs after WBV therapy.[27,28] The efficacy of WBV therapy on osteoporosis in SCI has not been thoroughly evaluated. However, one study was able to report an increase of percentage in BMD only at the knee after 12 months of WBV therapy.[25]

Potential Treatments

Additional potential treatments for SCI induced osteoporosis include romosozumab, abaloparatide, activin receptor blockers, and cathepsin-K inhibitors. Romosozumab (ROMO) is a new anti-sclerostin drug that has revealed a significantly greater improvement in BMD and reduced fracture risk in comparison with teriparatide treatment in post-menopausal women with osteoporosis.[29] Although ROMO has not yet been approved for men due to serious cardiovascular side effect risks, it has shown promising results of BMD improvement in its phase III clinical trial.[30] There is a lack of research on the effects of ROMO administration on the bone metabolism of the SCI population.

Abaloparatide is a bone forming agent used to treat post-menopausal osteoporosis in women who have failed antiresorptive therapy or have a high risk of fracture. Abaloparatide usage reduces the risk of osteoporotic fractures and the prevalence of hypercalcemia in comparison with teriparatide. Furthermore, it is more cost effective than teriparatide.[31] Again, there is a lack of research on the effects of abaloparatide administration on the bone metabolism of the SCI population. Not to mention, both romosozumab and abaloparatide have not yet been approved for males. Although romosozumab and abaloparatide have not proved their efficiency in SCI osteoporosis, they both remain potential pharmacological treatments.

Additional but less effective potential treatments currently being reviewed are type II activin receptor (ActRIIA) blockers and cathepsin-K inhibitors. Up to date, the efficacy of ActRIIA blockade has not been reviewed in people with SCI. Cathepsin-K is a protease involved in bone catabolism and research unveiled early bone loss prevention in post-menopausal women with cathepsin-K inhibitors.[3] However, cathepsin-K inhibitors have been found to increase the risk of stroke which led to the termination of its development, specifically odanacatib.[32] Therefore, ActRIIA blockers and cathepsin-K inhibitors remain potential pharmacological treatments for SCI osteoporosis as well.

Management

As for management, serial dual-energy X-ray absorptiometry (DXA) scans are utilized concurrently with bone biomarker monitoring and correction.[25] Up to now, the identification of clinical improvement via DXA scans has been limited due to the absence of an established guideline for SCI osteoporosis. Fortunately, the ISCD recently developed a task force to perform a multi-study review of the DXA scan's role during various aspects of SCI osteoporosis management. This review allowed the ISCD to create their official position statement on BMD testing in SCI. The official position statement reports the following verbatim:

> "1. All adults with spinal cord injury resulting in permanent motor or sensory dysfunction should have a DXA scan of the total hip, proximal tibia, and distal femur as soon as medically stable.
> 2. In adults with SCI, total hip, distal femur and proximal tibia bone density should be used to diagnose osteoporosis, predict lower extremity fracture risk, and monitor response to therapy where normative data is available.
> 3. Serial DXA assessment of treatment effectiveness among individuals with SCI should include evaluation at the total hip, distal femur, and proximal tibia, following a minimum of 12 months of therapy at 1- to 2-year intervals. Segmental analysis of total hip, distal femur and proximal tibia sub-regions from a whole-body scan should not be used for monitoring treatment.
> 4. There is no established threshold BMD value below which weight-bearing activities are absolutely contraindicated. BMD and clinical risk factors should be used to assess fracture risk prior to engaging in weight-bearing activities."

It is notable that the ISCD added the necessity of the person having sufficient turning radius for a manual or power wheelchair during the scan and that the chair must be equipped with a lift. Furthermore, focused areas containing artifacts should be recognized and should not be used for diagnosis, fracture risk assessment, or monitoring response to therapy. Some examples of artifacts include hardware, deformity, heterotopic ossification, contracture or movement (spasticity), or leg bag artifacts which prevent optimal position for scanning or limit the accuracy of the analysis.[33]

The CTX is a marker of bone resorption (degradation) and the P1NP is a marker for bone formation.[34] The biomarkers are used as a tool to help identify the appropriate recommendations for treatment along with other factors in the patient's history such as previous osteoporosis treatment plan, comorbid conditions, among other factors. In the literature, in treatment of naïve patients, an increase in P1NP was a predictor of BMD at 12 months.[35] There is no comparator to a median or expected ranges in this case but rather an improvement from baseline.

Conclusion

The findings in this case provide hope for bone health and strength in SCI patients as they continue to age with their disability. Newer anabolics, such as abaloparatide and romosozumab, have shown greater improvement than previous treatments in osteoporosis. We believe using optimal pharmacological agents, mechanical loading of the skeleton, and the ISCD guidelines will allow the best patient prognosis for the general population of SCI patients. The pathophysiology of spinal cord injury induced osteoporosis has been distinctly outlined. Our case exemplified progress that can be made with aggressive mechanical and biologic treatment. A basis for the derivation of future innovative therapies has been covered. Favorable treatments and management are referenced for best patient prognosis.

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Familial Hyperinsulinism due to HNF4A Deficiency and Benign Premature Adrenarche: A Case Report

Edward Compton,[1] David H. Geller,[2] Alaina P. Vidmar MD.[3]

Abstract

Background: Familial Hyperinsulinism due to HNF4A deficiency (FHI-HNF4A) is a form of diazoxide-sensitive, diffuse hyperinsulinism, characterized by transient or persistent hyperinsulinemic hypoglycemia, and a propensity to develop Maturity-Onset Diabetes of the Young type 1 (MODY1). The association between FHI-HNF4A deficiency and benign premature adrenarche (BPA) is unknown. **The Case:** We report the case of a 5-year-old girl with FHI-HNF4A, controlled on diazoxide, who presented with BPA and Tanner stage 3 pubic hair associated with body odor and acne. Work-up revealed elevated dehydroepiandrosterone sulfate (DHEAS), elevated free testosterone, and advanced bone age. Insulin levels were elevated in the setting of normal fasting blood glucose. We discuss the possible hormonal underpinnings of hyperandrogenism. **Conclusion:** Though the underlying pathophysiology of this phenotype is unclear, a possible synergistic mechanism exists between insulin-induced hyperandrogenism and HNF4A deficiency leading to a transient decrease of SHBG and thus increased free testosterone levels. Further investigation is required to determine the association between HNF4A dysfunction and BPA.

Key Words: Hyperinsulinism; Congenital Hyperinsulinism; Adrenarche; HNF4A; Hyperandrogenism (Source: MeSH-NLM).

Introduction

Congenital hyperinsulinism (CHI) is due to a variety of etiologies that result in dysregulated insulin release from pancreatic β-cells. There are two histological variants of CHI, focal and diffuse, which differ in the extent of pancreatic involvement. In the diffuse variant, all of the β-cells are affected, while in the focal form, a localizable lesion is found, affecting only a subset of the β-cells.[1] Insulin secretion uncoupled from glucose metabolism results in hyperinsulinemic hypoglycemia.[2,3] Familial Hyperinsulinism due to HNF4A deficiency (FHI-HNF4A) is a form of diazoxide-sensitive, diffuse hyperinsulinism, characterized by macrosomia, transient or persistent hyperinsulinemic hypoglycemia, and a propensity to develop Maturity-Onset Diabetes of the Young type 1 (MODY1). Patients with FHI-HNF4A are responsive to diazoxide treatment, which activates K_{ATP} channels, leading to increased potassium conductance, cellular membrane hyperpolarization, and inhibition of insulin release.[4,5] Patients with CHI due to other genetic variants, in which the mutation lies within subunits of the K_{ATP} channels themselves, are not responsive to diazoxide treatment.[6] The role of HNF4A in FHI-HNF4A has yet to be fully elucidated, but it is thought to work in combination with other transcription factors, forming a regulatory network of proteins in the pancreatic islet.[7] Mechanistically, HNF4A deficiency can impair the binding of HNF4A with p300, which then prevents HNF4A from binding to the promoter region of HNF1. Interestingly, there is a growing body of evidence that mRNA levels of HNF4A correlate with Sex Hormone Binding Globulin (SHBG) mRNA levels. Therefore, HNF4A deficiency may result in decreased SHBG, with subsequent increased levels of free testosterone.[8] The clinical consequence of this process is poorly understood.

Benign premature adrenarche (BPA) is a clinical diagnosis often associated with elevations of dehydroepiandrosterone (DHEA) and dehydroepiandrosterone sulfate (DHEAS) for chronological age,.[9,10] If phenotypic signs of androgen activity, such as pubic and/or axillary hair, adult-type body odor, oily skin or hair, comedones, or accelerated growth velocity, are detected before the age of 8 in females or 9 in increased rates of obesity in children with BPA.[9,10] However, other conditions that present similarly must first be excluded before BPA can be diagnosed. These include: central puberty, adrenocortical and gonadal sex-hormone secreting tumors, congenital adrenal hyperplasia, and exposure to exogenous androgens. In some populations, BPA has been associated with low birth weight, insulin resistance, adverse cardiometabolic risk, and progression to polycystic ovary syndrome (PCOS).[11-15] Herein, we report a 5-year-old female patient with FHI-HNF4A who presented with BPA in the setting of elevated insulin level, despite euglycemia on diazoxide therapy. The underlying pathophysiology of

Highlights:

- Familial Hyperinsulinism due to HNF4A deficiency (FHI-HNF4A) is a form of diazoxide-sensitive; diffuse hyperinsulinism, characterized by transient or persistent hyperinsulinemic hypoglycemia, and subsequent propensity to develop MODY1.
- By altering the HPA and HPG axes, hyperinsulinism may lead to increased levels of circulating androgens, which has been demonstrated in conditions with insulin resistance and subsequent hyperinsulinism, such as polycystic ovary syndrome (PCOS).
- Regulation of HNF4A by many factors indirectly regulates hepatic SHBG synthesis, as HNF4A plays an imperative role in the regulation of SHBG.
- The association of elevated insulin levels, insulin resistance, and functional hyperandrogenism has been previously described in youth with benign premature adrenarche (BPA) and polycystic ovarian syndrome (PCOS) however there have been no reports in a patient with FHI-HNF4A.
- These findings may suggest that patients with FFI-HNF4A may be at greater risk for insulin induced hyperandrogenism and therefore diazoxide dosage should be titrated to insulin levels to prevent functional hyperandrogenism and its sequelae.
- If HNF4A defects play a role in altering SHBG levels, it may be clinically relevant to screen patients with BPA for these alterations.

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this phenotype remains obscure; however, we discuss a possible synergistic mechanism between insulin-induced hyperandrogenism and HNF4A deficiency, leading to transient decrease of SHBG and thus increased free testosterone levels.

The Case

A 5-year-old girl with known FHI-HNF4A, who was first noted by her mother to have new-onset acne and body odor without any associated breast changes, pubic hair, or menses at 4 years of age, presented to the pediatric endocrinology clinic for follow-up. Her pubic hair had progressed to Tanner stage 3 with increased acne and body odor. No exogenous steroid exposures were reported. Physical exam revealed Tanner stage 1 breasts. Laboratory testing revealed abnormalities in the following: free testosterone 0.6 ng/dL (normal range < 0.04-0.14 ng/dL), and DHEAS 146 mcg/dL (normal range: , 34 mcg/dL). The following were within reference ranges: fasting laboratory testing revealed a HbA1c of 4.0% (normal range: 3.0-5.8%), a fasting blood glucose of 80 mg/dL (normal range: 70-100 mg/dL), anti-Mullerian hormone 1.3 ng/mL, estradiol < 7 pg/mL (normal range: < 7 pg/mL), total testosterone < 7 ng/dL (normal range: <7-20 ng/dL), insulin 11.3 uIU/mL (normal range: 2.0-19.6 uIU/mL), 17-hydroxypregnenolone 177 ng/dL (normal range: , 561 ng/dL), 17-hydoxyprogesterone 35 ng/dL (normal range: , 137 ng/dL), serum androstenedione 18 ng/dL (normal range : , 45 ng/dL and serum DHEA 159 ng/dL (normal range: , 487 ng/dL) (***Table 1***). A bone age study revealed an advanced bone age of 7.8 years and at this time, the decision was made to monitor the patient serially, without altering diazoxide dosing.

Table 1. Clinical and laboratory findings at most recent visit.

Characteristics	Patient Values	Reference Range (if applicable)
Age, years	6.0	
Bone age, years	7.8	
Weight, kg (%ile)	17.3 (15)	
Height (%ile)	110.7 (27)	
BMI (%ile)	14.12 (18)	
Tanner Stage (breast/pubic hair)	1/3	
Glucose, mg/dL	80	60-115
HbA1c	4.3	3.0-6.0
Anti-Mullerian Hormone	1.3	
Estradiol, pg/mL	< 7	<7
Total Testosterone, ng/dL	< 7	< 7
Insulin, uIU/mL	11.3	2.0-19.6
17-hydroxyprogesterone, ng/dL	35	≤ 137
17-hydroxypregnenolone, ng/dL	177	≤ 561
Serum androstenedione, ng/dL	18	≤ 45
DHEA sulfate, mcg/dL	146	≤ 34
DHEA, ng/dL	159	≤ 487

Legend: BMI = body mass index; DHEA = Dehydroepiandrosterone

The patient's past medical history was significant for premature delivery at 34 weeks gestation due to premature rupture of membranes. The vaginal delivery was complicated by prolonged labor and fetal distress. Her birth weight was 1870 grams, with an associated length of 43.15 cm, appropriate for gestational age. She had a macrosomic appearance at birth. She was admitted to the neonatal intensive care unit for fifty days, requiring supplemental oxygen for twelve days. She was found to have persistent hypoglycemia, requiring a glucose infusion rate of 18-20 mg/kg/minute. She was diagnosed with hyperinsulinemic hypoglycemia on day five of life and was started on diazoxide at 15 mg/kg/day. Subsequent laboratory and genetic testing confirmed her heterozygous HNF4A mutation (NM_00457.4 c.253C>T, p.Arg85trp – PubMed. 2030154, OMIM. 6160266), pathogenic for FHI-HNF4A. By the age of 2, she was taking 100% of her caloric needs orally, requiring gastrostomy tube (G-tube) supplementation only during times of illness. Her blood glucose levels were within the target range 90% of the day based on continuous glucose monitoring data and her HbA1c was 4.5%. Her father was diagnosed with FHI-HNF4A in infancy; at the age of 20, was found to have hyperglycemia consistent with MODY1.

The family was lost to follow up and presented for referral to the pediatric endocrinology clinic for consultation and management of congenital hyperinsulinism when she was 2.5 years old. At this time, she weighed 10.5 kg (< 3rd percentile), with a height of 87.5 cm (10th percentile) and BMI of 13.71 kg/m^2 (< 3rd percentile). On physical exam, she had numerous dysmorphic features including macrosomia, down-turned palpebral fissures, broad midface, low-set ears, and broad, wide-set thumbs. She had diffuse hypertrichosis of the arms, face, back, and abdomen. Her external genitalia were normal for age, with Tanner stage 1 axillary and pubic hair, and breasts with Tanner stage 1 development. At this time, blood glucose levels were being monitored only once daily, and it was recommended that blood glucose checks be increased to 6 times daily to ensure that cryptic hypoglycemia was detected, as HbA1c was < 4.0%. She was placed on an iPro glucose monitor (CGM) to collect continuous glucose levels for 96 hours, which demonstrated hypoglycemia 20% of the time. She was maintained on diazoxide at 12 mg/kg/day divided three times daily (TID). Due to concern for poor annualized growth velocity of 1.4 cm/year, a bone age was obtained, which showed skeletal age concordant with chronological age.

At a subsequent follow-up at 3.5 years old, her HbA1c was 4.0%, with weight gain and associated increased annualized growth velocity of 6 cm/yr. Continuous glucose monitoring was recommended to detect overnight hypoglycemic episodes, but the patient's family declined this option. She was receiving feeding therapy and her oral intake had improved significantly. Although she no longer utilized G-tube feedings, she was having multiple episodes of hypoglycemia overnight. Her diazoxide dose was increased to 13 mg/kg/day divided TID, with resolution of her overnight hypoglycemia.

Discussion

We report a unique case of a 5-year-old female with FHI-HNF4A who presented with Tanner 3 pubic hair, acne, body odor, elevated DHEAS and free testosterone, and advanced bone age in the absence of elevated estradiol levels. Her presentation is most consistent with BPA; however, the relationship between FHI-HNF4A and BPA remains poorly understood. Although the BMI percentile of our patient was 18%, prior studies have found an association between BPA and obesity.[9,10] There is a wide differential diagnosis for patients that are found to be persistently hypoglycemic after birth, including hyperinsulinism as in our patient, mutations in enzymes involved in fatty acid metabolism, glycogen storage disorders, counter-regulatory hormone deficiencies. While the differential is broad, we suspected hyperinsulinemia as the culprit in our patient, given her father's diagnosis of FHI in infancy. Thus, genetic testing was obtained early in her disease course. Many of the etiologies of persistent hypoglycemia in infancy involve a genetic component, highlighting the importance of obtaining a satisfactory family history, as this can help narrow the differential diagnosis, expediting achieving a diagnosis.

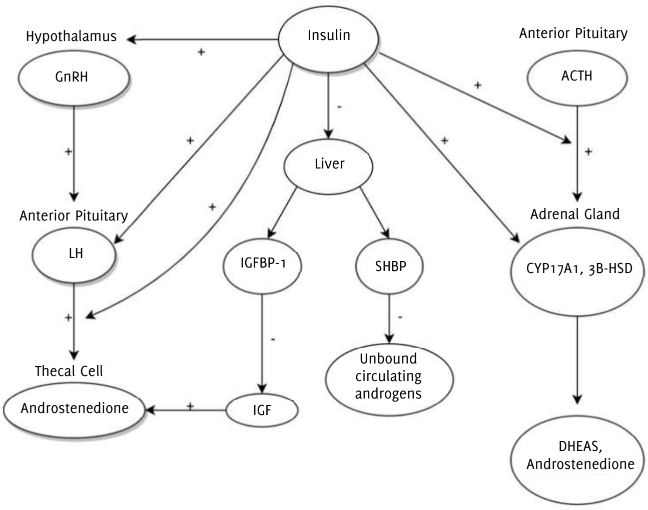
Besides HNF4A, other genes have been implicated in hyperinsulinemia, with the two most common being mutations in ABCC8 and KCNJ11. Mutations in these two genetic loci are responsible for both focal and diffuse forms of CHI, leading to vastly different treatments and outcomes. Therefore, genetic analysis becomes important for counseling families on treatment and prognosis, as one study demonstrated that detecting a single paternally derived mutation predicted focal disease 94% of the time.[16]

One possible mechanism to explain the observed association is that our patient was experiencing transient hyperinsulinism resulting in increased adrenal androgen production. Insulin is hypothesized to play a role in the regulation of the hypothalamic-pituitary-adrenal (HPA) and hypothalamic-pituitary-gonadal (HPG) axes.[17,18] A variety of regulatory mechanisms have been proposed, including altered expression of key enzymes involved in steroidogenesis, increased secretion of gonadotropin-releasing hormone (GnRH), increased amplitude of luteinizing hormone (LH) pulses, potentiation of ACTH-stimulated steroidogenesis, and inhibition of SHBG production.[8] By up-regulating one or both of the HPA and HPG axes, hyperinsulinism may lead to increased levels of circulating androgens. In patients with conditions such as PCOS, which have been associated with BPA, elevated total and free androgens have been demonstrated in the setting of insulin resistance and decreased SHBG.[19,20] However, prior studies have not explored the potential relationship between FHI-HNF4A or other genetic CHI disorders, and BPA. Mechanistically, insulin has been demonstrated to increase mRNA levels of CYP17A1 and 3β-HSD and potentiate ACTH production of intermediates involved in DHEAS synthesis, leading authors to conclude that the hyperandrogenic features observed in PCOS may be due in part to a hyperinsulinemia-derived increase in adrenal androgens.[21,22]

Ibanez *et al.* studied 10 non-obese adolescent females who had experienced BPA, hirsutism, ovarian hyperandrogenism, oligomenorrhea, dyslipidemia, and hyperinsulinemia. These females were administered metformin daily for 6 months, which reduced insulin levels, hirsutism, and hyperandrogenism, and attenuated the release of LH in response to GnRH pulses. One of the mechanisms by which metformin improves hyperglycemia in diabetes is through the inhibition of mitochondrial glycerophosphate dehydrogenase, which inhibits gluconeogenesis and increases insulin sensitivity, thereby decreasing insulin requirements. Metformin administration also increases SHBG, leading to decreased serum-free androgens.[23,24] Importantly, the authors noted that DHEAS decreased with metformin, buttressing the argument that insulin increased adrenal androgen production.[23] In a study contrasting 47 adolescent females with BPA vs 22 healthy female controls, Kaya *et al.* found that females with BPA had higher body mass indexes and insulin concentrations.[10] These females also had hyper-responsiveness to ACTH, leading to increased androstenedione and DHEA levels. This study further elucidates the unique role insulin plays in the regulation of adrenal sex hormone production.

An additional mechanism to consider in this patient is the effect of HNF4A function on SHBG levels. Hammond *et al.* proposed that activation of the SHBG promoter in the liver involves HFN4 binding to a DR1-like cis-element which then stimulates production.[25] Therefore, in HNF4A deficiency, SHBG production would be decreased, with consequent increases in free androgen levels. Winters *et al.* found a strong positive correlation between the level of HNF4A mRNA and SHBG mRNA, with an inverse relationship between insulin resistance/insulin levels, and circulating SHBG and HNF4A mRNA levels.[26] These findings suggest that circulating SHBG levels may be mediated by HNF4A and provide further insight into the mechanism by which HNF4A deficiency could predispose a patient with FHI-HNF4A to BPA. The combination of these two molecular entities could have resulted in the BPA-like phenotype observed in our patient. A summary of the proposed mechanisms of insulin regulation of androgen synthesis and circulatory levels is shown in ***Figure 1***.

Figure 1. Proposed mechanisms of insulin regulation of androgen synthesis and circulatory levels.



Legend: 3B-HSD = 3β-hydroxysteroid dehydrogenase; ACTH = Adrenocorticotropic hormone; CYP17A1 = cytochrome P450 17A1; DHEAS = dehydroepiandrosterone sulfate; GnRH = gonadotropin releasing hormone; IGF = insulin-like growth factor; IGFBP-1 = insulin-like growth factor binding protein 1; LH = luteinizing hormone; SHBP = sex hormone binding protein.

This case demonstrates that clinically silent hypoglycemia with concomitant intermittent hyperinsulinemia may have long-term sequelae for the patient. Therefore, even if glycemic control is adequate overall, with HbA1c levels within normal limits, it is important not to ignore either glucose levels or HbA1c levels that are down-trending. Large fluctuations in blood glucose levels should be avoided, with close monitoring of daily glucose checks. In our patient, glucose checks were only being performed once daily; subsequent continuous glucose monitoring demonstrated hypoglycemia 20% of the time. This highlights the importance of more rigorous glucose monitoring in these patients, as they may not present with the normal signs of hypoglycemia (diaphoresis, lightheadedness, tachycardia, etc.) and thus their hypoglycemia may go clinically undetected until more severe sequela develops. This has important treatment implications, as tight medical management becomes paramount. While our patient responded well and tolerated diazoxide, other patients may not respond as well, requiring additional treatment considerations to adequately control glucose, and subsequently, insulin levels.

We believe that our patient may have been experiencing episodes of hypoglycemia, as evidenced by her HbA1C levels on the low end of normal. Episodes of hypoglycemia may have been due to intermittent hyperinsulinemia in spite of diazoxide treatment. We hypothesize these periods of hyperinsulinemia may have been sufficient to increase adrenal steroidogenic activity, and subsequently, increased circulating levels of DHEAS. Furthermore, her HNF4A deficiency may have led to a decrease in SHBG levels resulting in elevated free testosterone. Future studies are needed to 1) investigate the underlying molecular etiology of hyperandrogenism in patients with FHI-HNF4A and BPA, 2) elucidate the optimal dosage of diazoxide treatment in FHI-HNF4A to prevent any long-term sequelae that could occur in the setting of transient hyperinsulinemia, and 3) explore the relationship between HNF4A deficiency and BPA.

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INTERNATIONAL JOURNAL *of* MEDICAL STUDENTS

The Experience and Perplexities of the COVID-19 Situation in Pakistan

Amna Kaneez Fatima Raja[1], Mohummad Hassan Raza Raja[2], Maryam Ashfaq[1].

The Experience

The Coronavirus Disease 2019 (COVID-19) has progressed into a full-blown pandemic within a short span of time. Pakistan has been one of the countries that initially fared better with an early response and a nation-wide lock-down starting on April 1, 2020. It was able to slow the spread. However, because people paid no heed to the warnings during the annual Muslim festival of Eid-ul-Fitr, there was a massive spike in the number of daily new cases. The rise started on May 26, 2020 and peaked on June 14, 2020 with 6,825 new cases reported. Afterwards began a gradual decline, however this unfortunately was short lived. With the world in the throes of a second wave of COVID-19 (beginning in October of this year in Pakistan), it really seems like certainty is nothing more than a mirage.

I am a third-year medical student in one of the public sector medical colleges of the country. This pandemic has provided the medical student community a chance to witness situations never expected or experienced before. While some experiences have been constructive (e.g. actually experiencing a public health emergency), others have highlighted certain deep-rooted problems that still exist in Pakistan's healthcare and education sectors.

Student Experience

From April 1, 2020 up to the present, the situation has remained ever changing. Early on, there was no sense of alarm and the academic schedules continued as usual. It was only after the first cases were reported that some sense of uncertainty started to seep in. The government acted promptly, and all educational institutions were closed. This closure lasted until September of this year, but with the recent alarming second spike in new cases, institutions had no choice but to shut down again following a government order that was issued on November 26, 2020.

Unsurprisingly, medical education is in a state of disorder. While some medical colleges scrambled to complete on campus final examinations in the short interval between the two closures (following all measures recommended to reduce the transmission risk), others decided to delay them even further. The best course of action for professional institutions to take is in much contention with students, parents, and health authorities because they all have differing opinions.

Online learning has put forth a whole set of unique challenges in Pakistan. While some students face connectivity issues as they live in remote areas, the families of others struggle to provide the electronic devices needed to access classes in the first place. Moreover, nationwide recorded lectures are actually not utilized in a lot of places. This poses an interesting comparison with other medical students worldwide in developed nations, with Liu, an American medical student, writing that most of their lectures were already recorded online pre-pandemic and hence there was no major shift in learning modality, unlike what has been faced in my part of the world.[1] The rapid initiation of such a teaching pedagogy has been a huge adjustment for students and teachers alike to learn from and deal with software such as 'Google Classroom'. Another problem is that online case discussions, or even patient simulations in the rare instances that such software is available, simply cannot replace hands-on clinical training. Many ward rotations have had to be missed, with students only completing the minimum number of required training hours during the time that colleges re-opened. This is similar to the situation in India, with Kalra et al. writing early on in the pandemic that clinical rotations had been suspended altogether.[2] One can imagine that while didactic teaching may have continued at more or less the same pace, the effect the pandemic has had on clinical teaching in medical education has yet to be fully quantified.

At one point, we heard a rumor that third-year medical students would be called to volunteer in their respective teaching hospitals. Even without the aforementioned difficulties of hospital exposure being cut short, third year students already have minimal clinical experience. A lot of medical colleges in Pakistan follow a non-integrated or hybrid system of study, which means that in the first three years basic science subjects are mainly taught and examined. Therefore, while third year students do attend wards and receive some clinical training, the knowledge gained is not formally tested in the end of year promotional exam. Hence, one can imagine the subsequent panic that we all felt at the mere possibility of being called into hospitals with our still very shaky history taking skills. However, thankfully, this rumor never transpired.

While it is still undeniable that students can perform useful tasks in the hospital as seen elsewhere around the world, it must be considered that developing countries such as Pakistan simply do not have the resources available to supply the required training and PPE to volunteers.

On a brighter side, this lockdown has brought medical students together in an effort to help those around them. A large percentage of our population consists of daily wagers, who have been hit hardest in this lockdown. These are people who survive on the income they earn each day such as those who sell food items on stalls, carry out handy-work, taxi drivers etc. With people staying at home during the lockdown, making ends meet has been a true struggle for them. Keeping this in mind, numerous ration drives were started by students throughout the country. With the poor spiraling into even deeper poverty, it was an undoubted fear that starvation could also be the cause of many deaths. There has also been a sharp decline in blood donations with people staying home. Consequently, medical students have carried out awareness campaigns highlighting the plight of

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Thalassemia patients during this difficult time. Blood donors have also been identified, and donations arranged, for affected families.

Stories from Seniors in the Hospital

During this time, our recently graduated seniors have been regularly filling us in about their experiences while on duty in the hospital. The common themes we hear from them are the lack of trained work force, scarcity of Personal Protective Equipment (PPE), and the fear of contracting the illness. It has become the norm to hear of various, unique dilemmas faced by health care workers. For example, many hospital staff from rural areas, with low salaries, share rooms with each other in urban centres. Clearly, this is not ideal, as many now face the predicament of sharing rooms with potentially COVID-19 positive colleagues, as they cannot afford to self-isolate or they risk going home and exposing their families. Doctors also have had the mammoth task of reasoning with the relatives of victims, many extremely distressed that they would not be able to partake in some funeral rituals such as bathing the dead body, a duty that had been solely transferred to hospital staff according to the initial protocol. Due to this dilemma, many families are hesitant to send their sick relatives to the hospital in the first place. But by no short margin the worst experience of theirs has been seeing fellow colleagues contract the illness. Up until October 21, 2020, it has been reported that 87 healthcare workers have lost their lives to this virus, with about 8,272 infected.[3]

While flowers and billboards thanking essential health care staff are warm gestures (Figure 1-2), what they really need are adequately equipped treatment facilities and a compliant, sensible population ready to take their advice.

Figure 1. This poster shows a tired doctor who is making a pledge with herself to 'stay awake till morning' with a responding statement, 'the nation salutes you - thank you'. Metropolitan Corporation Islamabad.

Dealing with Public Myths

A large percentage of the population is not able to see the devastating effects that the disease can bring if simple precautions are not carried out. With a literacy rate of 58%, it becomes the duty of medical students in developing countries such as Pakistan to spread awareness and depth of understanding to those around them. Especially when met with statements that I myself have been told such as: 'A mask! How can I wear a mask! Women cover their faces not men!' (referencing the 'niqab,' a face veil), 'Corona doesn't exist,' 'Never go to the hospital for treatment. Doctors will inject you with poison,' 'The hospital is one of those few places with one entrance and no exit,' which unfortunately are commonplace. A lot of the time, denial can run in our own families. It is because of this careless attitude that frontline workers are being put under phenomenal amounts of risk. We as students can play a vital role in dispelling such self-harming ideologies by carrying out awareness campaigns. Such campaigns will also be useful once a vaccine is widely available, as the public may require encouragement to get vaccinated. In fact, trials involving the CanSino COVID-19 vaccine candidate are currently underway in three major hospitals of Pakistan and we are hopeful that it will be available next year.[4]

Figure 2. This banner states 'Thank you for your bravery in the war against Corona Virus - The civil society of Pothohar region'.

Personal Experience

Lastly, there is the experience of my father, a practicing physician, becoming unwell with COVID-19. Although Reverse Transcription Polymerase Chain Reaction (RT-PCR) tests repeatedly came out negative, he was finally diagnosed on High Resolution Computerized Tomography (HRCT).

False negative results as reported by many studies, may simply occur because of taking the test too early, poor sampling techniques, and suboptimal transportation.[5-7] In fact, in a certain study 75% of the patients that had a negative RT-PCR result had positive chest Computerized Tomography (CT) findings. Hence, CT scans have proven to be much more accurate in diagnosis.[8] This information is important to disseminate to those around us, as negative testing can become the sole reason to not self-isolate.

My father was undoubtedly among the few fortunate patients in Pakistan who was able to receive prompt treatment, which included many coveted drugs in short supply, such as Remdesivir. Another drug also in short supply is Tocilizumab. Dexamethasone, on the other hand, is widely available and was being given to seriously ill patients in Pakistan even before its life-saving action in ventilated patients was announced.[9] Unfortunately, many treatment options remain unaffordable for many in our population.

An important aspect gained from this personal experience was to realize and understand a patient's and family's perspective and stresses in such a difficult time.

Conclusion

COVID-19 is far from over. It is a situation that all of us can contribute to no matter how small. It does not matter if medical students cannot actively play a role on the frontline. We can support the doctors in other ways, such as raising awareness, convincing people to self-isolate, and dispelling any misconceptions. With hard work and a positive attitude, I am sure we will remember this time as a great opportunity and driver for positive change in healthcare systems worldwide.

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Is There A Doctor Onboard?

Holly Cathryne Brownlee.[1]

The Experience

I was 35,000 feet in the air and 90 minutes into an early morning flight to mainland Europe when the call alarm began to sound. As I moved towards the accumulating cluster of the flight crew, I saw that a woman was slouched back into her chair, seemingly unresponsive. I stated that I was a medical student and asked if anyone was more qualified onboard; they put out a call and received no response. So, I proceeded with my ABCDE approach, as has been dutifully drilled into me by my medical school. Thankfully she was breathing, and her airway wasn't compromised; she was unresponsive to voice but did respond to pain. A and B were assessed for now. I considered laying her down in the aisle and elevating her legs, suspecting vasovagal syncope, but this was not feasible given her size and the limitations within the cabin. Onto C, her heart rate was slightly high at around 90 beats per minute, and her capillary refill was less than 2 seconds. I did not have a sphygmomanometer to hand, nor was there a stethoscope anywhere onboard; however, I did manage to acquire a smartwatch that enabled me to monitor her heart rate and even provided an electrocardiogram, showing her to be in sinus rhythm. Her Glasgow Coma Scale (GCS) was 9 when I arrived,[1] and her pupils were equal but sluggish to react.

I then asked them what medical equipment they had onboard giving her oxygen supplied by the cabin crew. Essentially: plasters and a defibrillator. I proceeded to take a collateral history from her husband and ascertained that she felt faint and nauseous and then proceeded to lose consciousness. She was in her early 50s with no medical history of note. She had eaten that morning and had not been drinking alcohol. I then checked her GCS again, which was down to 8. It had now been over 5 minutes and I feared it was a possibility she may lose her airway. However, I was also acutely aware of my own lack of competencies if this were the case. There was a discussion between myself, the pilot, and the crew regarding the diversion of the plane. I presume the pilot was in contact with the medical crew on the ground; however, I was not made aware of this.

In the meantime, I continued to monitor the vital signs that I could and her neurological status and after some time, the lady began to regain consciousness. Her GCS quickly returned to 15; she was orientated to time and place and neurologically intact with the exception of a slight tingling sensation in her left arm. She remained stable for the rest of the flight, and I attempted to keep her and her husband as calm as possible and answering any questions but making sure they understood I was not yet a qualified doctor. I asked the aircrew to ensure an ambulance was waiting when we landed and wrote down a record of what had occurred for the paramedics, and the lady took a picture of my notes to show her General Practitioner. I then enjoyed a complimentary chocolate bar and chatted with her about her holiday plans until we landed, and I handed over to the paramedics and said goodbye. Disembarking the flight into the early morning sunshine, I began to reflect on the morning's events, questioning my actions and decisions and calling the most experienced doctor I knew, my Mum, to go over what had happened.

I am aware that many people have had a similar experience and have reflected on the legal risks and obligations involved alongside the logistics of attending to an inflight medical emergency.[2-4] I have discovered through research that as a medical student I was under no legal obligation to assist, however, the law varies internationally in this regard concerning qualified physicians. I made it clear that I was not a qualified doctor and made sure to act within my own competencies. I was aware at the time that I was not legally permitted to administer prescription medication but did not know what the legal implications may be regarding any wrong decision I made. The Good Samaritan law would protect me somewhat, however, the legislation varies between countries.[5-6] Referring to The Good Medical Practice guidelines from the General Medical Council, which state the responsibility of a doctor to assist in an emergency is always of relevance. However, this does not apply directly to medical students.[7]

Another aspect of my experience was the limited equipment I was provided and what equipment may have been useful. Upon research, there is no standard set of medical equipment European airlines carry and no set guidelines or consensus leading to a variation in what is available on any given flight.[8-9] For example, the reduced partial pressure of oxygen must be considered in the use of a pulse oximeter, and the sound of the engines makes the use of a stethoscope impractical. Airway adjuncts should be included in a medical kit for emergencies. However, these must be used only by those who are qualified to do so. If my patient had lost their airway, I would not have been competent to establish a definitive airway however, I could have opened her airway and used a bag valve mask if needed. Finally, in a medical landscape dominated by algorithms and proforma, it felt unusual to be in a situation without these tools for guidance. A standardized handbook containing guidelines for common medical emergencies onboard aircraft would be a useful tool for all onboard, including medical practitioners and the cabin crew. This would provide standardized guidance for those assisting in the challenging environment of a commercial aircraft and is certainly something I would have been grateful for.

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IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Experience

Reflection of a Second Year Medical Student: Navigating Medical School with Chronic Illness

Marcel Blignaut.[1]

The Experience

Three years ago, in the middle of my junior year of high school, my life was thrown into disarray when I started experiencing debilitating chronic pain and fatigue. In the midst of what was already an academically important year, the unrelenting constellation of symptoms I was experiencing was nothing more than an unsparing disruption. In only a few weeks, I had been subjected to what seemed to be a never-ending series of diagnostic workups. These included an MRI of the sacroiliac joints and an array of blood tests, including rheumatoid factor, erythrocyte sedimentation rate, anti-nuclear antibodies and human leukocyte antigen B27. In the end, all results pointed to a dead-end with common differential diagnoses such as spondyloarthropathies, lupus, and rheumatoid arthritis all being ruled out. On June 27th, 2018, my rheumatologist was finally able to tell me that I had fibromyalgia, a chronic pain condition involving widespread muscle pain, fatigue, problems with sleep, and cognitive issues.[1] With fibromyalgia lacking specific diagnostic markers and the tender point criteria (which my rheumatologist had made use of) having limitations, the long-delayed final diagnosis was essentially one of exclusion.[1] However, with my doctor's words came a sense of relief for not only did it validate the agonizing symptoms I experienced daily, but it opened the path to getting better. Despite knowing that fibromyalgia was a life-long condition, I did not know what the state of my health would be at any point during the three years that have passed since.

At the time of writing, I am a second-year medical student. Although I have lived with fibromyalgia for just under three years now, it has never been more relevant in its impact on my personal life as it is now. Like most of my peers, I stress over the desire to perform well academically and keep up with the tremendous workload. After my diagnosis in 2018, I successfully learned how to find balance between performing well academically and taking care of my health. My efforts were so successful that I remained almost entirely symptom-free for a year. Some of these efforts included getting at least eight hours of sleep each night, going for 30-minute walks five times a week, and minimizing my stress by taking breaks from studying and seeing a clinical psychologist. Unfortunately, my ability to find and execute this balance was sidetracked upon beginning medical school. I knew medical school would be challenging but what I had failed to anticipate was it becoming more onerous to find and maintain this balance. In my time as a second-year student, my fibromyalgia symptoms have been at their worst since my diagnosis. I have long been mindful of the strong correlation between stress and fibromyalgia flareups, something I picked up on as I was learning to control my symptoms. Ever since, I have made strong efforts to minimize my stress levels so as to avoid flareups.

Although the first year of medical school was stressful, I was able to keep most fibromyalgia symptoms under control. Unfortunately, the first seven weeks of second year were not as kind. Compared to first year, this year's workload has been twice as much and the work thrice as difficult. Needless to say, the stress has caught up with me. Although I have been successful in staying on top of the work, the fear of falling behind or performing poorly on assessments has proved to be enough to provoke my fibromyalgia. In staying on top of my work, I have also found myself neglecting taking time off from studying to take short walks or relax, thereby sacrificing some of the very measures which had kept me symptom-free in high school. From the first week, my body has harassed me with unrelenting muscle spasms and twitches, issues with short term memory, and severe fatigue. The muscle spasms have found opportunity in sitting at a desk all day due to remote online learning in response to the current COVID-19 pandemic, with the smallest deviation from correct posture triggering disabling pain. The severe fatigue has also taken advantage of a second-year sleep schedule. Despite always aiming for eight hours of sleep every night, I often find myself needing to settle for six hours in order to finish the day's work. Although those two hours may seem insignificant to the lay individual, it is enough to send my body into even more pain the next day. To make matters worse, the fatigue has me yearning for long naps which I often cannot afford as it risks me falling behind with work and causing myself further stress. Essentially, fibromyalgia and medical school join forces in creating a vicious cycle. Aside from the muscle spasms and fatigue, issues with short term memory have been one of the most distressing manifestations of my fibromyalgia flareups. With courses such as anatomy, physiology, and molecular medicine being taken this year, I have had to rely heavily on the ability to retain copious amounts of information. There are few things more frustrating than forgetting something I read over not even 30 seconds before. Not only does it result in taking twice as long to complete lectures, but it also adds significant stress to the studying process. The brachial plexus is an intimidating topic for many and requires continuous revision for it to become common knowledge. However, add the ability to forget what the superior trunk is seconds after reading about it, and the studying process becomes agonizing and tedious in return.

Living with fibromyalgia has not made medical school easy and the opposite holds true as well. As I am writing this, I am in the process of finding ways to restore balance between my academics and good health by planning my work to make space for at least eight hours of sleep and 30-minutes of exercise each day to minimize my pain levels and the stress associated with both my health and academics. I doubt it will be a simple undertaking and one that will likely need to be repeated in future years as I encounter new obstacles. However, I have come to appreciate my fibromyalgia as more than something holding me back. Fibromyalgia has significantly influenced my passion for medicine. Aside from admiring the human body since I was 12 years old when I started struggling with my health, the diagnostic challenge of fibromyalgia contributed significantly to this admiration as learning about the complexity and extensiveness of the body's pathologies only

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further strengthened my desire to study medicine. Most importantly however, I was put in the position to sympathize with the millions of others going through similar battles, which is the reason I aspire to be a rheumatologist and contribute to breakthroughs in the management of fibromyalgia. I also believe that my story will make me a better doctor by being able to connect with future patients. Although I have in this journey often felt alone, I find comfort in hearing of peers and other students in positions similar to mine.

I have found two stories like mine published in medical literature. The first details a fourth-year medical student's experience of living with diabetes in medical school, described as "both challenging and rewarding".[2] The second describes the experience of an anonymous doctor living with sarcoidosis since medical school in a very similar fashion to that of the first story.[3] The doctor mentions both their struggle with accepting their diagnosis and learning to take care of their health as well as the hope of becoming a more empathetic doctor because of their illness.[3] It is this very aspect of "both challenging and rewarding" that I think underlies the importance of these stories being told. Despite there being many more of these stories, they are seldom recognized or spoken about which these individuals feeling isolated, even though we are not. In fact, the author's anonymity in the second story above clearly demonstrates how we have been conditioned to keep our stories to ourselves for fear of shame, alienation, stigma, or pity. I wish to share three messages with those who are living stories similar to mine. The first would be to know that our circumstances and experiences are nothing short of a testament to our strength and resilience. The second is that we should take the time to find and appreciate the hidden blessings in our circumstances. Lastly, I encourage all fighting similar battles to find both a balance between their health and academics as well as a strong support system. I hope that in the future, more of these stories are shared proudly with the world for they deserve to be heard and commemorated.

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IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Letter to the Editor Regarding "The Vigil of Medicine"

Casey P. Schukow.[1]

The Letter

I was pleased reading "The Vigil of Medicine" written by Kelly and wish to applaud the author for her take on the journey of medicine, as she referenced her personal experience backpacking the John Muir Trail.[1] The author's message of not being alone during this journey brings a warming reminder to students around the globe that we must all continue to push through challenging times (such as the COVID-19 pandemic), as we do so together.

When the author stated, "do not be afraid to take a moment to look behind you", I could truly visualize a sea of upcoming students holding their own headlights, waiting to begin their paths in medicine. As I enter my final year of medical school, I think about my classmates, and how I hope they know how proud I am of all their hard work, sacrifice, and dedication.

Being part of the "string of headlights that snake up the mountain", we must understand the important roles and responsibilities we take on as leaders to those that trail behind us. Many medical schools throughout the United States encourage and incorporate leadership development opportunities within their curricula.[2] In the United Kingdom, medical student societies have incorporated the sharing of stories and experiences from clinical leaders to help better develop medical students as leaders among their peers and future physicians, too.[3]

While in medical school, it is important for us as students to take on leadership positions within our respective programs and/or communities. Having these leadership opportunities as medical students not only strengthens our relationships with our peers and respective faculty, but it also allows us to learn how to keep the path of headlights behind us burning bright. For example, I had the privilege of developing my leadership skills while as a Peer Mentor (PM) during my second year of pre-clerkship (or pre-clinical) training from 2019-2020. My duty as a PM was to be a source of mental health, personal, emotional, and academic support for incoming first years, especially during their rigorous Fall semester.[4] In our campus' location of Detroit, Michigan, we decided to provide snacks nearly every Sunday night/Monday morning to have in the student lounge for our first-year classmates. The snacks were never of charge to our classmates, as they were meant to bring everyone together in the student lounge, prior to COVID-19 restrictions, to relax and converse in-between lectures. Every week, the first years would express how thankful they were to us for this.

As trust between us PMs and our first-year classmates grew, we began incorporating other events such as subject review sessions, tutoring periods, and even 'mental health' walks. During these walks, we would leave campus together as a group and walk to a nearby local ice cream shop several hundred meters near campus. By end of my time as a PM in 2020, I not only was able to help the first years survive a time portion of their pre-clerkship training, but I was able to build strong friendships with them, too. Many of the first years were impacted by how much we helped them as PM and gladly took over duties to be PM themselves once my class graduated from pre-clerkship training. In essence, PM demonstrates one way we as medical students can continue to keep those headlights behind us bright from year to year.

Many students in the United States would agree that the second year of medical school is, undeniably, a challenging year as the stress of preparing for the first round of national board examinations (i.e., USMLE Step 1, COMLEX Level 1) becomes increasingly evident.[5] Although I admit to feeling this same level of stress when I was a second-year medical student, as did the other PMs, being able to assist our first-year classmates was truly rejuvenating. This opportunity proved to be a unique way for us to build strong relationships with our first-year classmates and, personally, helped strengthen my sense of purpose as a leader.

Reflecting on this moment after reading "The Vigil of Medicine", I see how our actions as Peer Mentors helped pave the path for our first-year classmates to survive their Fall semesters. Today, as many of our then first year classmates have completed their second year of medical school and are beginning to take their national board examinations, I feel an exuberant amount of joy knowing we were able to help guide them along their paths. Wherever we may be in both the world and our medical training, let us continue to lead those behind us so that the path of headlights can burn brighter for years to come.

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