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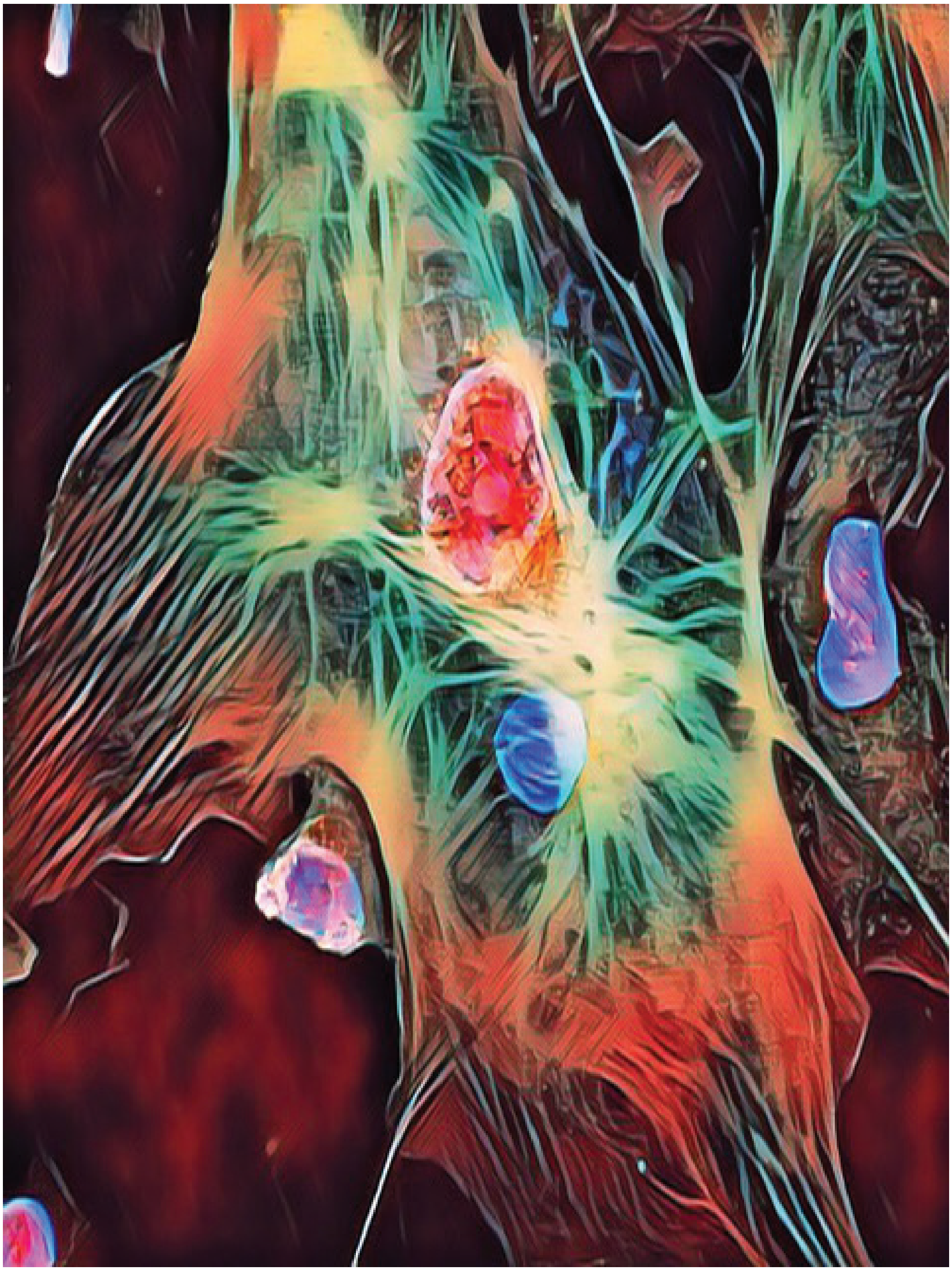

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COVER ARTIST

Roger Davis Class of 2020, College of Human Medicine, Michigan State University

Nanomedicine: The future of molecular medicine using nanotechnology for directed therapy. After creating a genetic mouse model of a human obesity syndrome, I isolated and grew a live cell culture from the tissue of that model. I utilized immunofluorescence to illuminate dynamic structures in the microscopic photograph of these growing cells. Digital photograph editing software has evolved since I originally took this picture over 15 years ago. I've now created this new representation of gold nanoparticles targeting the nucleus and cytoskeleton of a cell, using my original image as a template. I am hopeful such nanoparticles/nanotechnologies could lead to improvements in the pharmacokinetics of existing chemotherapies for a wide variety of human diseases. Nanomedicine could opens up the possibility for developing novel cellularly-targeted therapies with improved outcomes and fewer side effects.

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CASE REPORTS

ARTICLE

BRIEF REPORTS

Primary Intestinal Lymphangiectasia: A Case Report

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Abstract: *Primary intestinal lymphangiectasia (Waldmann's disease) is a rare protein-losing enteropathy which is mostly seen in young children. A 22-month-old male baby presented with a 1-week history of abdominal distension, chronic loose stools, recurrent ear infections, and failure to thrive. He had edematous eyelids and non-pitting edema of his hands and feet. The patient was diagnosed via endoscopic visualization and biopsy of the lymphangiectasia in the small bowel. He was managed through dietary restriction with a high-protein, low-fat diet. The patient subsequently had resolution of the diarrhea and an increase in albumin and total protein on labs. We describe a rare case of primary intestinal lymphangiectasia and highlight its clinical presentation, diagnosis, and treatment.*

Keywords: *primary intestinal lymphangiectasia; Waldmann's disease; protein-losing enteropathy*

INTRODUCTION

Primary intestinal lymphangiectasia, also known as Waldmann's disease, is a rare protein-losing gastroenteropathy which is seen in young children. Its prevalence is unknown. It is believed to be caused by congenital malformation of intestinal lymphatic vessels. Patients will typically present with diarrhea, edema, failure to thrive, and frequent infections. While there is no cure, it is managed through dietary restrictions which include a low-fat, high-protein diet. The following is a case of primary intestinal lymphangiectasia seen in a 22-month-old male baby.

Case Report

A 22-month-old male baby was admitted to the pediatric surgery department with a 1-week history of abdominal distention and concern for bowel obstruction. His symptoms began 2 weeks before presentation with fever and vomiting. Those symptoms resolved over several days, but he subsequently developed abdominal distention. The patient had a history of chronic loose stools exacerbated by dairy products. His mother denied difficulty passing urine, blood or mucus in the stools, abdominal pain, episodes of crying, or respiratory symptoms. He had hypothyroidism but no history of urinary, kidney, or cardiac disease. In addition, he had a history of recurrent ear infections requiring myringotomy tube placement, and the recent history of presumed viral gastroenteritis. Developmentally, he did have delays in gross motor skills having started crawling at 13 months and walking at 19 months. There was no family history of gastrointestinal disease or malabsorption syndromes. His only medication was levothyroxine. All immunizations were up to date. The patient's mother had an unremarkable, term pregnancy with uneventful delivery with no complications. Of note, meconium was passed within the first 12 h after birth.

On physical exam, the patient had normal vital signs with both height and weight between the 25th and 50th percentiles. He had edematous eyelids and non-pitting edema of the hands and feet. His abdomen was soft and distended with diffuse tenderness but no guarding. There were no abdominal masses, hernias, or organomegaly. There was no lymphadenopathy. The rest of the physical exam was normal.

An abdominal ultrasound revealed a dilated, fluid-filled bowel throughout the abdomen with mild bowel wall thickening suggestive of gastroenteritis, small bowel intussusception, and a small amount of free fluid. A Complete Blood Count (CBC) with differential showed lymphopenia with an absolute lymphocyte count of 1.00 K/uL, but was otherwise normal. Liver function testing showed a very low albumin of 1.1 g/dL and a very low total protein of 2.8 g/dL. A stool alpha-1-antitrypsin was very high at 570 mg/dL. Immunoglobulin G (IgG)

Table 1. Pertinent laboratory findings.

Laboratory studies	Patient	Reference ranges
Absolute lymphocyte count	1.00 K/uL	3.0–9.5 K/uL
Albumin	1.1 g/dL	3.5–5.0 g/dL
Total protein	2.8 g/dL	6.3–7.9 g/dL
Stool alpha-1-antitrypsin	570 mg/dL	≤54 mg/dL
IgG	159 mg/dL	313–1170 mg/dL
IgA	22 mg/dL	36–79 mg/dL

and Immunoglobulin A (IgA) were low at 159 and 22 mg/dL, respectively (Table 1).

Hospital course

An upper endoscopy was unremarkable. However, a lower endoscopy revealed colonoscopic visualization of lymphangiectasia, and biopsy findings were consistent with the diagnosis. The patient was advised to start a high-protein, low-fat diet with avoidance of dairy products. He subsequently had resolution of the diarrhea and an increase in albumin and total protein on repeat labs.

Final diagnosis

Waldmann's disease (primary intestinal lymphangiectasia).

DISCUSSION

Waldmann's disease or primary intestinal lymphangiectasia is a protein-losing enteropathy caused by dilatation and subsequent rupture of lymphatic channels, or lacteals, in the small intestinal wall. Most cases present before 3 years of age but may be diagnosed in adulthood. The disease is rare and of unknown etiology.[1,2] The pathophysiology is unknown, but a possible mechanism is lymphatic channel malformation in the neonatal period, leading to increased intraluminal pressure within the lacteals, eventually causing dilatation, rupture, and subsequent release of lymphatic contents into the bowel.[3] The consequent loss into the bowel of albumin, immunoglobulins, lymphocytes, and chylomicrons – containing triglycerides and fat-soluble vitamins – account for the observed clinical manifestations of this disease.

Clinical manifestations of Waldmann's disease are mostly due to the protein-losing enteropathy. Peripheral edema due to hypoproteinemia is the most common clinical characteristic. The edema is pitting and often found in the lower extremities bilaterally, but edema in the face and external genitalia may be observed in severe cases. Patients may have serous effusions into the pleural, pericardial, or peritoneal cavities. Anasarca is rare but has been reported. Less commonly, lymphedema is observed, resulting in a non-pitting edema usually in the distal lower extremities bilaterally.[1] Persistent, moderate, watery diarrhea is another common presenting feature. Abdominal complications are due to hypoproteinemia or bowel wall edema due to dilated lymphatic vessels. Hypoproteinemia can cause ascites, leading to abdominal distention. Bowel wall edema may lead to mechanical ileus due to decreased lumen size, an abdominal mass, or intussusception.[4]

Nonspecific systemic symptoms, failure to thrive, and developmental delay may be observed as a result of diarrhea, hypoproteinemia, and malabsorption of fat-soluble vitamins. Recurrent and opportunistic infections are seen in patients with significant hypogammaglobulinemia and lymphopenia. Cases of cryptococcal meningitis, cryptococcal osteomyelitis, cryptosporidium or viral gastroenteritis, necrotic enterocolitis, and necrolytic migratory erythema have been reported.[5]

The diagnosis requires endoscopic visualization of lymphangiectasia in the small bowel followed by characteristic pathologic findings on biopsy. Pathologic findings include the presence of lacteal contents, dilated lymphatic vessels, and an absence of villous atrophy or microorganisms. Laboratory investigation may strongly suggest the diagnosis. Decreased total protein and albumin, hypogammaglobulinemia, and lymphopenia are frequent findings. The humoral defect manifests as decreased levels of IgG, IgA, and Immunoglobulin M (IgM), whereas cellular immunity defect is frequently observed as CD4+ lymphopenia. A highly suggestive finding is high 24-h stool α1-antitrypsin due to enteric protein loss. Stool α1-antitrypsin has replaced albumin scintigraphy as the preferred test for protein loss. Abdominal ultrasound may show nonspecific features, such as bowel wall thickening, dilated bowel loops, ascites, intussusception, and plical hypertrophy. Abdominal computed tomography (CT) shows small bowel wall thickening and edema. CT may be particularly helpful in localizing the area of lymphangiectasia in the small bowel. Capsule endoscopy can also describe the extent of lymphangiectasia as it traverses the entirety of the small bowel.[6]

The differential diagnosis includes many conditions that have intestinal lymphangiectasia and protein-losing enteropathy as a secondary feature. These include constrictive pericarditis, sarcoidosis, surgical repair of congenital heart disease, Crohn's disease, Whipple's disease, intestinal lymphoma, intestinal tuberculosis, and radiation or chemotherapy with retroperitoneal fibrosis.[6] A thorough history and physical exam are usually sufficient for ruling out secondary causes, and a small bowel biopsy is helpful in some cases.

The primary treatment is a high-protein, low-fat diet rich in medium chain triglycerides. Medium chain triglycerides are absorbed directly into the portal venous circulation, bypassing chylomicron transport and thereby avoiding lacteal engorgement. This diet provides protein and fat while limiting dilatation and rupture of the lacteals. Patients may have clinical and laboratory recovery within several weeks of initiating the diet. The need for this dietary control appears to be lifelong.[6,7] Other treatment suggestions have not been highly validated. Antiplasmin and octreotide may alter lymphatic permeability or absorption to attenuate lacteal engorgement, but are not well-supported therapies. Surgery may be effective for removing bowel with localized lymphangiectasia but is only indicated in rare cases. Albumin infusion is sometimes used for symptomatic relief of edema caused by hypoproteinemia.[1] Antimicrobial prophylaxis may be considered in patients with recurrent infections, although dietary control usually improves clinical immunologic function in these patients.[5]

CONCLUSION

Primary intestinal lymphangiectasia or Waldmann's disease is a rare protein-losing gastroenteropathy seen in young children, likely caused by congenital malformation of intestinal lymphatic vessels. Clinical manifestations include edema, persistent diarrhea, failure to thrive, developmental delay, and recurrent infections. A detailed history and physical exam are essential as there are numerous secondary causes of intestinal lymphangiectasia. A targeted laboratory investigation may be highly suggestive of the disease, although diagnosis requires endoscopic visualization and biopsy of the small bowel. Treatment consists of a low-fat, high-protein diet rich in medium chain triglycerides.

Learning Points

- Primary intestinal lymphangiectasia (Waldmann's disease) is a rare protein-losing gastroenteropathy seen in young children caused by congenital malformation of intestinal lymphatic vessels.
- Symptoms include edema, persistent diarrhea, failure to thrive, developmental delay, and recurrent infections.
- To diagnose, endoscopic visualization and biopsy of the small bowel is required.
- Treatment consists of lifelong low-fat, high-protein diet that is rich in medium chain triglycerides.

Conflict of interest and funding
The material presented is original, has not been previously published, and has not been submitted for publication elsewhere. All authors have no conflicts of interest. Authors R.A. and P.G. contributed equally to this article. The authors have not received any funding or benefits from industry or elsewhere to conduct this study.

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Malignant Chondroid Syringoma of the Foot – A Case Report

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Background: *This case report is about a very rare tumor – a malignant chondroid syringoma. The objective of this piece is to review both the case presented along with the current literature on cutaneous adnexal tumors.*
Case Presentation: *The patient is a 73-year-old Caucasian female with a past medical history of treated colon and breast cancer who presented with a 2-year history of a slow-growing, painful cutaneous lesion on the medial aspect of her right foot. The patient presented to her primary care physician (PCP) for right foot pain, which was attributed to bunions. The PCP encouraged the patient to see a podiatrist for this issue. Upon presentation to the podiatrist, the patient had a right foot biopsy. The pathology report showed a mixed malignant chondroid syringoma with positive margins. A re-excision to ensure complete removal was recommended. The patient presented to surgical oncology and subsequently she underwent complete excision of the right foot mass. At the time of her last visit, 7 months postoperatively, the patient continued to have issues with wound healing and continuous drainage of her surgical wound.*
Discussion: *This case differs from much of the current literature surrounding cutaneous adnexal tumors as it is a malignant chondroid syringoma of the foot, which is exceedingly rare. There are only three other published case reports of similar malignancies in similar places. This case study is important due to the uniqueness of the case. This case serves as a reminder of the importance of biopsy for diagnosis prior to management, as it is unlikely that such rare soft tissue tumors can be diagnosed without biopsy.*
Conclusion: *The take away lesson of the case is that it is important to biopsy unknown masses, and to have follow up with specific specialists.*

Keywords: *Malignant; chondroid; syringoma; foot; adnexal cancer; cutaneous tumor*

INTRODUCTION

The subject of the current case study is malignant chondroid syringomas, which are an exceedingly rare type of cutaneous adnexal carcinoma.[14,16,18]

Cutaneous adnexal tumors can be either benign or malignant, and have morphologic differentiation toward several structures in skin, such as hair follicles, sebaceous glands, apocrine glands, and eccrine glands.[15,16,18] Chondroid syringomas are mixed tumors of sweat (eccrine or apocrine) gland origin. According to a recent study examining malignant cutaneous adnexal tumors, there were 4032 diagnoses between 1988 and 2006 in the United States.[1] Of these, the median age of diagnosis was 70 years, and males were more often affected than females.[1] Most of the tumors were located on the head and the neck.[1,14,15] About 7.2% of cases were in the lower extremity, making lower extremity malignant cutaneous adnexal tumors even more of a rarity.[1] Chondroid syringoma has a reported incidence of 0.098% among all primary skin tumors, and the malignant version has had less than 50 cases reported by 2017.[2,3] Although little information is published about malignant chondroid syringoma, it seems to metastasize relatively quickly and have a poor prognosis in cases that do metastesize.[4] The 5-year survival rate is good in the absence of distant metastasis.[5]

We report a 73-year-old female who presented with a right foot mass that was later diagnosed as malignant chondroid syringoma.

CASE PRESENTATION

Chief Complaint

Right foot pain and mass.

History of Present Illness

The patient is a 73-year-old Caucasian female who presented to her primary care physician (PCP) in 2017 with right foot pain. At that point in time, she had a 1.5-year history of a slow-growing painful mass on the medial aspect of her right foot. It was initially attributed to bunions as the patient had a long history of bilateral bunions, but her PCP encouraged her to see a podiatrist for further management the pain in her right foot. When she presented to the podiatrist, the podiatrist did an incisional biopsy of the lesion, which turned out to be a malignant chondroid syringoma. The patient was then referred by her PCP to surgical oncology. At the time of presentation to surgical oncology, she was asymptomatic apart from worsening pain in her right foot. She denied fever, chills, weight loss, or night sweats. She had no other complaints during this time.

Timeline

Patient noticed right foot mass → (1.5 years later) Patient presents to PCP → (5 months later) Patient presents to podiatrist → (1 month later) Patient referred to surgical oncology → (1 month later) Patient receives surgery → (4 months later) Patient is followed up within clinic by PCP

Past Medical History

The patient's medical history is significant for rectal adenocarcinoma treated in 2012 and has been in remission since, and carcinoma of the right breast treated by modified radical mastectomy and systemic chemotherapy in 1999 has been in remission since. The patient also has hypertension.

Family History

The patient's family history is insignificant.

Medications

The patient's medications included hydrochlorothiazide 25 mg/day, furosemide 20 mg/day, and metoprolol 100 mg B.I.D.

Allergies

None applicable.

Social History

The patient does not drink alcohol, smoke tobacco, or use any illicit drugs/substances.

Physical Examination

General

The patient is alert and oriented.

Vital Signs

Stable.

Extremities

Examination of the right foot reveals a healing scar measuring 1 cm, underlying which is an area of induration involving the skin. There is an indurated area on the medial aspect of the foot measuring about 6–7 mm transversely and 1.5 cm vertically. No lymphadenopathy can be appreciated in the popliteal area or the groin.

Assessment

Staging for malignant cutaneous adnexal tumors is performed using the staging system for cutaneous squamous cell carcinoma.[6] This tumor is stage T2 since the tumor is greater than 2 cm in its greatest dimension. There are no involved lymph nodes or metastasis, so the patient is N0, M0. She would classify as stage II, since she is T2, N0, M0. The surgical oncology team relied on the biopsy report based on the sample that the podiatrist collected. There were no metastases.

Plan

Surgical management.

Surgical Management

The patient underwent wide excision of the chondroid syringoma of the right foot. She was brought to the operating room and administered general anesthesia, and the area was sterilized. An elliptical incision measuring 4 × 2 cm was fashioned and deepened through subcutaneous fat down to the underlying digital nerve and tendons. The lesion was excised and sent to pathology, and the subcuticular and skin approximated with suture. There were no surgical complications.

Final Pathology

Skin and soft tissue, clinically right foot, small focus (0.13 mm) of residual malignant chondroid syringoma, within margins of excision.

Follow-Up and Outcomes

Although little information is known about this rare type of tumor, the prognosis is poor.[2] Unfortunately, the patient presented to her PCP 4 months postoperatively with continued surgical wound drainage. She was again seen 7 months postoperatively and was found to have continual wound drainage and infections, although there was no concern about regrowth of the mass as the tumor was completely removed.

DISCUSSION

This case was a rare presentation of malignant chondroid syringoma of the foot. There are only three other published case reports of similar presentations. One case was the report of a 72-year-old male with a large malignant chondroid syringoma involving a toe, published in 2018 in China.[7] Another reported case was that of a 47-year-old female with a 20-year history of a mass on her left foot which was a malignant chondroid syringoma.[8] The final reported case was published in 2016 and was a report of a 43-year-old male with a malignant chondroid syringoma of the plantar aspect of the right foot.[8]

This case is interesting as it is a patient with a previous history of cancer presenting with a rare soft tissue malignancy of the foot. Previous research does not indicate that there is an increased risk of malignant chondroid syringoma in patients with a history of cancer.

As previous research shows, malignant chondroid syringoma is a rare entity. When present, it is usually located on the head and neck.[1] Therefore, this disease would be low on the differential diagnosis for this patient had a biopsy not been performed. In addition, a higher incidence of malignant adnexal tumors occurs in patients with germline mutations predisposing to such tumors.[9] Syndromes that may be associated with cutaneous adnexal tumors include Brooke-Spiegler syndrome and Cowden syndrome, among others.[9]

Surgery is currently the standard of care treatment for malignant chondroid syringomas, with wide local excision being recommended for extremity lesions. Radiation therapy should be reserved for patients in whom surgery is not an option or a postsurgical adjuvant treatment when surgical margins cannot be cleared.[10] Since lymph nodes are rarely involved, the role of sentinel lymph node biopsy is not recommended, as per a population-based study examining malignant cutaneous adnexal tumors from 1988 to 2006.[5] Local recurrence rates range from 10 to 50% among patients treated with wide local excision or Mohs micrographic surgery.[11] Routine postsurgical follow-up visits are advisable to monitor for recurrence.[12,13]

Limitations of this case include the absence of photographs of this case, along with the absence of histopathological staining. It is not known if this patient has any germline mutations, which is another limitation of this piece.

A literature review was performed on PubMed and on Google Scholar on April 6, 2018. There were 4618 hits for 'malignant chondroid syringoma' on PubMed, many of these were related to salivary gland tumors and pleomorphic adenomas. Another search was performed for 'malignant chondroid syringoma', excluding 'pleomorphic adenoma' and 'salivary gland', and it had 32 results. Of these, three reports were case studies of malignant chondroid syringoma of the foot.

CONCLUSION

Soft tissue masses in the lower extremities including the feet may warrant biopsy in unexplained cases. Without biopsy, it is unlikely that the mass in this patient would have been diagnosed as malignant chondroid syringoma prior to surgery. Having the pathological diagnosis is important for determining treatment options, especially in someone who may have a history of cancer, requiring us to rule out metastasis versus primary cancer.

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Case Report

A Needs Assessment Pilot Study of Patients with High Utilization in an Academic Inpatient Setting

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Background: *A disproportionate amount of health care spending in the United States is attributed to a small subset of patients who employ inpatient and emergency department (ED) services. While patients with high ED utilization have previously been well-described, patients seen in an inpatient academic medical setting may differ with regard to demographics, medical conditions, and social factors.*

Objectives: *We aimed to characterize patients with high utilization in an academic inpatient setting for the purpose of identifying unmet needs.*

Setting and Patients: *Adults aged 18–80 were eligible for inclusion if they had more than three admissions to a general medicine service of an academic medical center within a large health care system. Patients who were admitted for pregnancy, oncology, trauma, or surgical procedures for acute conditions or were diagnosed with dementia or encephalopathy were excluded. Twenty-six patients met inclusion/exclusion criteria and were approached to be interviewed, of which 13 agreed to be interviewed.*

Measurements: *Face-to-face administration of a self-reported survey assessing unmet needs regarding services for medical or mental health needs, access to health care, housing, transportation, or legal services, and any other barriers to health the respondent identified.*

Results: *All of those surveyed had health insurance and regular visits with primary care providers (mean 14 visits per 12 months). The most prevalent medical conditions identified were depression (85%) and chronic pain (77%). In addition, patients self-identified having an average of 2.2 chronic conditions. Financial struggles were common as 62% of the respondents reported annual incomes of <$12,000, and 77% were unemployed over the previous 12 months.*

Conclusion: *These results indicate unique clinical and social characteristics associated with high readmission rates at one academic medical center, suggesting the need for additional patient-centered research of this population to aid in the development of novel strategies to reduce overutilization and improve health.*

Keywords: *needs assessment; high utilization; super utilizers; high utilizers; academic medical center*

INTRODUCTION

Much of the literature on patients with high utilization focuses on emergency department (ED) utilization. The top 4.5–8% of patients with high ED utilization account for 21–28% of all ED visits.[1] However, patients with high inpatient utilization are not necessarily patients with high ED utilization who get admitted. If a hospital were to design interventions for patients with high utilizations in an inpatient setting using the needs of patients with high ED utilization, this could be ineffective or even harmful. Therefore, through this pilot study, we aimed to characterize patients with high utilization in an academic inpatient setting to identify unmet needs regarding services for medical or mental health needs, access for health care, housing, transportation, or legal services, and any other barriers to health the respondent identified.

The literature, while not directly comparing the two populations, hints at distinct differences. Patients with high inpatient utilization have been reported to be older than patients with high ED utilization.[1,2] While patients with high ED utilization have been found to present with acute complaints,[2] admitted patients with high inpatient utilization have been found to present with chronic disease exacerbations. Pain has been found to be a common presenting complaint in both groups of patients.[2–4]

We aimed to find a better understanding of these admitted patients' needs to allow future design of successful interventions. Therefore, we aimed to define the characteristics of admitted patients with high utilization in an academic medical center using a face-to-face needs assessment survey.

METHODS

Study Design and Setting

The University of Minnesota Institutional Review Board approved this study, which was performed by medical students in person by means of a needs assessment survey (Appendix 1). We interviewed patients on the general medicine floor of an academic medical center within a large health care system in the Minneapolis/St. Paul metro area from January to June 2016. Adult patients 18–80 years old who were admitted to the general medicine floor and had been admitted three or more times in the previous 12 months (inclusive of the current admission) were eligible to participate. We excluded patients who were pregnant at any point, admitted for treatment for oncology, trauma, or surgery for acute conditions, or who had previously been diagnosed with dementia or encephalopathy.

Eligible patients were identified through the electronic medical record and approached to participate. Patients who agreed to participate received a $10 gift card. After informed consent was obtained, the needs assessment survey was administered in person, which comprised questions regarding patient demographics, medical and mental health history, health care access, drug and alcohol abuse, education, employment, average monthly income over the past 12 months, housing, transportation, legal consult, and any other barriers to health the patient acknowledged. Self-identified race was included in patient demographics to determine if our survey population was representative of the census data of Hennepin County where the study was performed.

We constructed the needs assessment by combining questions from several validated surveys (Appendix 1). We piloted and refined the needs assessment with five respondents who met inclusion criteria; these responses were not included in the final analysis.

We created several composite variables for analysis. We defined chronic diseases as heart disease, diabetes mellitus, chronic pain, chronic obstructive pulmonary disease, and hypertension. We defined a mental health need as having been diagnosed with depression, having serious personal or emotional problems in the last 12 months (as defined by the respondent), or needing but not receiving mental health counseling. We defined substance use as non-prescription drug use or daily alcohol use.

Study data were collected and managed using REDCap electronic data capture tools hosted at the University of Minnesota.[5] Descriptive statistical analyses and data processing were performed with R version 3.2.1[6] and RStudio version 0.99.467.[7]

RESULTS

In total, 26 respondents met inclusion criteria, and 13 respondents consented and completed this pilot study for a 50% response rate.

Baseline characteristics of the respondents are shown in Table 1. The average number of inpatient admissions in the preceding 12 months was 10.77 (SD 3.94). All respondents had a primary care provider and health insurance. Respondents self-reported that they had seen their primary care provider an average of 14 times (range 3–48) in the preceding year. In terms of medical needs, a majority of respondents (77%) had more than one chronic disease (Figure 1), with the most prevalent chronic diseases being depression (85%) and chronic pain (77%; Table 2). In addition, almost all respondents identified a mental health need (92%) and we found a relatively low prevalence of reported substance use (15%; Table 3).

In terms of social needs, a majority of respondents (62%) earned less than $12,000 per year and were unemployed over the preceding year (77%). In addition, a majority of the respondents (62%) needed government assistance in terms of food and housing assistance and almost half of the respondents (46%) needed transportation assistance in the prior 3 months However, only a minority of the respondents (23%) had housing instability. A majority of the respondents (92%) had more than one person with whom they discuss important matters (Table 4).

A majority of the respondents (75%) named communication between the patient and the care team as a barrier.

DISCUSSION

This study characterized 13 patients with high health care utilization in an academic medical center inpatient

Table 1. Demographics.

	Current study	Hennepin county
Male sex (*n* [%])	6 (46.2)	
Age (mean [sd])	43.77 (8.52)	
Number of inpatient admissions in 12 months (mean [sd])	10.77 (3.94)	
What is your race or ethnicity? (*n* [%])		
White = Yes	11 (84.6)	74.4
African American or Black = Yes	1 (7.7)	11.8
American Indian or Alaskan Native = Yes	1 (7.7)	0.9
Asian = Yes	0 (0)	6.2
Latino, Hispanic, or Spanish Origin = Yes	0 (0)	6.7
Native Hawaiian or Other Pacific Islander = Yes	0 (0)	0.0
What is your educational background? (%)		
Graduated college	5 (38.5)	
Graduated high school or got GED	7 (53.8)	
Some college, did not graduate	1 (7.7)	
What is your average monthly income over the past year? (*n* [%])		
$1,001–$1,800	2 (15.4)	
$1,801–$2,600	2 (15.4)	
$201–$1000	5 (38.5)	
Less than $200	3 (23.1)	
More than $2,600	1 (7.7)	
How many months have you been employed in the last year? (*n* [%])		
6 months or more	1 (7.7)	
Less than 6 months	2 (15.4)	
None	10 (76.9)	

Total respondents = 13. *n* = number of respondents. % = percentage of total study population. Data for Hennepin County from U.S. Census Bureau, 2010 Census.

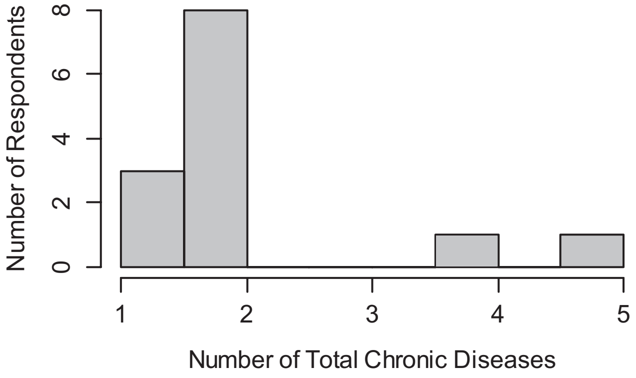

Figure 1. Distribution of total number of chronic diseases. Chronic diseases were defined as heart disease, diabetes mellitus, chronic pain, chronic obstructive pulmonary disease, and hypertension. Mean total number of chronic diseases per patient = 2.15 (Standard Deviation = 1.14). Overall *n* = 13.

setting. All of the respondents had health insurance and a primary care provider. In addition, financial struggles were common as more than a majority of the respondents reported annual incomes of less than $12,000,

Table 2. Medical conditions.

Do you have a primary care provider (PCP)? = Yes (%)	13 (100.0)
If yes, in the past year, how many times have you seen your primary care provider (PCP)? (mean [sd])	14.35 (13.24)
Do you have health insurance? = Yes (%)	13 (100.0)
Total number of chronic diseases per patient (mean [sd])	2.15 (1.14)
Patients with >1 chronic disease (*n* [%])	10 (76.9)
Patients with >2 chronic diseases (*n* (%))	2 (15.4)
Have you been diagnosed by health care provider with any the following health conditions?	
Heart disease (*n* [%])	2 (15.4)
Cancer (*n* [%])	2 (15.4)
Stroke (*n* [%])	2 (15.4)
Diabetes (*n* [%])	4 (30.8)
Depression (*n* [%])	11 (84.6)
Chronic pain (*n* [%])	10 (76.9)
COPD/asthma (*n* [%])	7 (53.8)
High blood pressure (*n* [%])	5 (38.5)

Total respondents = 13. *n* = number of respondents. % = percentage of total study population.

Table 3. Mental health.

	n (%)
Respondents with mental health needs	12 (92.3)
Respondents with substance use	2 (15.4)
During the past 12 months, have you had any serious personal or emotional problems? = Yes	3 (23.1)
During the past 12 months, did you seek help for any personal or emotional problems from:	
Family or friends?	8 (61.5)
A therapist, counselor, or self-help group?	4 (30.8)
A priest, minister, rabbi, or other religious counselor?	4 (30.8)
During the past 12 months, was there any time when you needed mental health care or counseling, but didn't get it because you couldn't afford it? = Yes	2 (15.4)

Total respondents = 13. *n* = number of respondents. % = percentage of total study population.

Table 4. Social needs.

Income and employment	
How many months have you been employed in the last year? *n* (%)	
None	10 (76.9)
Less than 6 months	2 (15.4)
6 months or more	1 (7.7)
What is your average monthly income over the past year? *n* (%)	
Less than $1,000	8 (61.5)
More than $1,000	5 (38.5)
Housing and transportation	
Where do you live now? (*n* [%])	
Currently own a house/apartment	4 (30.8)
Currently rent a house/apartment	7 (53.8)
Other	2 (15.4)
Are you at risk of losing your housing? (*n* [%])	
No	9 (69.2)
Pass	1 (7.7)
Yes	3 (23.1)
Do you currently receive government assistance for housing? = Yes (%)	3 (23.1)
How many times in the last year have you been unable to seek medical care due to transportation issues? (%)	
3 or more	5 (38.5)
Less than 3	1 (7.7)
Never	7 (53.8)
In the last 30 days, did you ever cut the size of your meals or skip meals because there wasn't enough money for food? = Yes (*n* [%])	3 (23.1)
If Yes, in the last 30 days, how many days did this happen? (mean [sd])	2.67 (0.58)
Do you currently receive government assistance for food? = Yes (*n* [%])	6 (46.2)
On government assistance = Yes (*n* [%])	8 (61.5)
Legal	
In the past year, have you received legal assistance? (from a lawyer or legal aide) = Yes (*n* [%])	1 (7.7)
Social support	
How many people do you discuss important matters with? (mean [sd])	3.69 (2.06)
Respondents with more than one important person = Yes (*n* [%])	12 (92.3)

Total respondents = 13. *n* = number of respondents. % = percentage of total study population.

being on food or housing assistance and being unemployed for the previous 12 months.

Our rationale for conducting this study was to compare our findings from our face-to-face needs assessment to previously reported characteristics of patients with high ED utilization. The age of the respondents in the current study were more comparable to patients with high ED utilization but as opposed to patients with high ED utilization, the respondents presented with unique medical issues such as chronic pain management and depression.[1] This demonstrates the unique medical complexity of patients served by our tertiary academic medical center. However, similar to the patients in our study, pain was a common symptom with high utilization visits in the ED.[8] This is unsurprising as chronic pain has been associated with higher health care expenditures[9] and health care use.[10,11]

As opposed to medical needs, social needs of the respondents in our study mirrored the social needs of patients with high ED utilization. Patients with high ED utilization have high rates of unemployment with incomes below the poverty level but have low rates of housing instability.[1,8,12] In addition, similar to the respondents in our study, 94% of patients with high ED utilization had relatives or friends for support.[8]

All patients in our study had health insurance, consistent with previous studies.[2,13] However, while previous studies of admitted patients with high utilization of public insurance in Tennessee demonstrated only 54% of respondents having a primary care physician,[2] all respondents in our study reported that they had a primary care physician. While this could be related to the small sample size in our study, it is also possible that the primary care surplus in Minnesota may have provided greater primary care access as opposed to the deficit in Tennessee.[14]

As compared with previous studies, this study found a low prevalence of substance use disorders and lower rates of hypertension and congestive heart failure. Previous studies of admitted patients with high utilization have found substance use disorder prevalence rates of 57%.[15] The low prevalence found in the current study could be attributed to the survey method as patients are less likely to report illicit drug use during an in-person interview or may not identify opiate use disorder as substance abuse or dependence given the high prevalence of chronic pain observed in the current study.[16]

Even though our study differs from previous studies by relying on self-reports of patients of their medical conditions, previous studies have demonstrated high accuracy of self-reports for heart disease, diabetes mellitus, and hypertension, although some of the studies may have been confounded by the education level of the participants.[17,18] Rates of diabetes mellitus, hypertension, and heart disease were lower in our sample, suggesting the relative youth and unique medical complexity of the patient population.

Limitations of the study include the low number of respondents and the lack of a comparison group of patients without high utilization for statistical comparison. In addition, barriers to health for non-English speaking patients could not be analyzed because only native English speakers were included in the study. Finally, differences in sources of insurance could not be analyzed as our study did not differentiate between private and public insurance.

Future work should elucidate the attitudes of patients with high utilization on the communication between the patient and the health care team, as this was the most common additional barrier mentioned by respondents and further elucidating whether their primary care access is adequate.

In addition, patients with high utilization in multiple hospital settings should be surveyed using the needs assessment with a comparison group for statistical analysis.

This pilot study surveyed patients with high utilization in an inpatient setting at an academic medical center using a needs assessment tool. Even though patients with high utilization have been characterized in multiple settings, it is important for each hospital to examine its own population of patients with high utilization to determine the best means of supporting them.

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Expert Opinions on Healthcare for Immigrants in Norway

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Background: *Documented immigrants eligible to stay in Norway for more than 6 months can enroll in the universal healthcare system for full healthcare services, such as acute, chronic, and preventative care.[1] All other non-citizens only have access to emergency services. With an increasing influx of immigrants to Norway, it is advantageous to evaluate the Norwegian healthcare system, how documented and undocumented immigrants utilize the system, and any barriers they may face when doing so. The aim of this study is to identify barriers to healthcare for immigrants in Norway in order to better address them in the future.*

Methods: *Sixteen subjects with knowledge of immigrant healthcare in Norway were interviewed. Participants were asked the same standardized four questions; answers were audio-recorded, transcribed, and analyzed.*

Results: *Major themes that emerged included the following: (1) universal access is a benefit once accepted into the system, (2) timeliness is an issue, (3) chronic disease and mental health are common immigrant-specific health issues, and (4) language and lack of cultural competency are major barriers to care.*

Conclusion: *There is a need for improved translation services and cultural competency as the immigrant population in Norway increases.*

Keywords: *Norway; healthcare; immigrant; barriers to care; language*

INTRODUCTION

The World Health Organization's (WHO) constitution states that 'the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic, or social condition'.[2] A 1992 comparative study on immigrant health found only three of seven advanced industrial countries (Canada, the United Kingdom, and Sweden) had taken steps to promote equity of access and quality for immigrants in their health services.[3] These steps include the creation of comprehensive and universal health systems that target the needs of immigrant populations, such as seeking to remove economic and administrative barriers for immigrant populations seeking both specialized and general healthcare.[3] More than 25 years later, the focus on health equity for immigrants has increased globally. However, according to the 2016 Migrant Integration Policy Index (MIPEX) Health Strand, many countries still take a passive approach to the issue.[4]

Norway has historically been a homogenous society, with the large majority of the national population consisting of native Norwegians. In 1988, the country passed the Immigration Act and immigration to Norway increased.[5] In recent years, the inflow of immigrants to Norway has reached record levels, leading to a change in the demographic landscape of the country.[1] Research shows that 'the ethnic and cultural diversity in Norway is greater now than ever before'.[6]

Immigrants are defined as 'being born abroad by two foreign-born parents and registered as residents in Norway'.[7] Registration as a Norwegian resident offers healthcare entitlements such as assignment to a general practitioner and healthcare cost coverage. Undocumented immigrants, otherwise known as illegal or irregular immigrants, are 'third-country nationals without a valid residence permit or visa allowing them to reside in the country of destination and who, if detected, may be liable to deportation'.[8] Undocumented immigrants only have access to emergency services. This limits their ability to obtain specialist services and engage in preventative care. In Norway, the correlation between people's socioeconomic status and their state of health is significant and well established.

In 2016, at the time of data collection for this project, there were '848,200 immigrants and Norwegians born to immigrant parents in Norway, representing 16% of the entire population'.[9] The current Norwegian immigration policy states that 'all immigrants who are admitted to Norway should have equal legal and practical opportunities in society.'[5] This research explores the Norwegian healthcare system and immigrant healthcare access by interviewing those who are working in the field. The study aims to identify barriers to immigrant healthcare access so that they may be better addressed in the future. Access issues for both documented and undocumented immigrants are included in this study.

METHODS

Sampling and Recruitment

For this study, an expert is defined as an individual with 5 or more years of experience who is currently working with immigrants in a clinical or research-based healthcare setting. Participant were found using a convenience sample. Initial interviews took place with healthcare professionals at the Norwegian Centre for Migration and Minority Health (NAKMI). Additional participant were found through contacts given by NAKMI employees. Job experience ranged from 6 to 49 years. Job titles included the following: physician, researcher, public health worker, consultant, hospital advisor, and director of specific hospital affairs. The study design was reviewed and approved by the Michigan State University College of Human Medicine IRB.

Interviews

All interviews were conducted in person in August 2016. Sixteen individuals were interviewed via eight individual interviews and three focus groups. A total of 24 professionals were employed at this time by NAKMI. Participants signed a consent form for participation and audio recording of their responses. No compensation was given for participating in the study.

The participants were asked the following four questions:

1. From your experiences, what are the positives and negatives of the Norwegian healthcare system?
2. What experiences have you had regarding immigrants seeking healthcare services?
3. What health issues are specific to immigrant populations?
4. What are the barriers to care for immigrants in Norway?

The researchers did not prompt any discussions other than posing the initial question. Interpretation of each question was at the discretion of the participant.

Data Analysis

The researchers divided the audio recordings, and one researcher was assigned to transcribe each interview verbatim onto a word document. A second researcher read through the transcription while listening to the audio recording to check the transcription for accuracy. All transcriptions were uploaded to Dedoose, a qualitative software program. Each researcher read through every transcription individually and identified themes and subthemes. The researchers met after every three transcriptions were read to discuss themes. If three of the five researchers agreed on a theme or subtheme, it was added to a running list of themes, and the passage was coded under this theme using the Dedoose software program. After all transcriptions were coded, the number of times each theme or subtheme was mentioned was totaled. The percentage that each theme was mentioned compared to the total number of coded passages was determined.

RESULTS

The researchers coded a total of 276 passages. The most frequently coded theme was 'barriers to care' (89/276 or 32.2%). Other frequently mentioned themes included healthcare system negatives (19.5%), immigrant-specific health issues (13.4%), and healthcare system positives (11.2%). The most prominent themes are displayed in Figure 1.

The results are categorized under four most frequently mentioned themes: barriers to care, negatives, immigrant-specific health issues and positives. Subthemes pertaining to each main theme are discussed below. Interjections and conversational elements unrelated to the discussion were removed from the included quotations.

Barriers to Care

Language was the most frequently discussed barrier to care. Participants discussed how language barriers affected immigrants' abilities to both communicate with their provider and navigate the healthcare system. One participant stated:

> The language is the key, the key here in Norway. If you can [speak] Norwegian then you can get anything, but if you cannot speak Norwegian, then you need a translator but […] sometimes… we don't know what he or she is translating to the patient. And of course, immigrants sometimes they won't have a translator... if an immigrant comes to

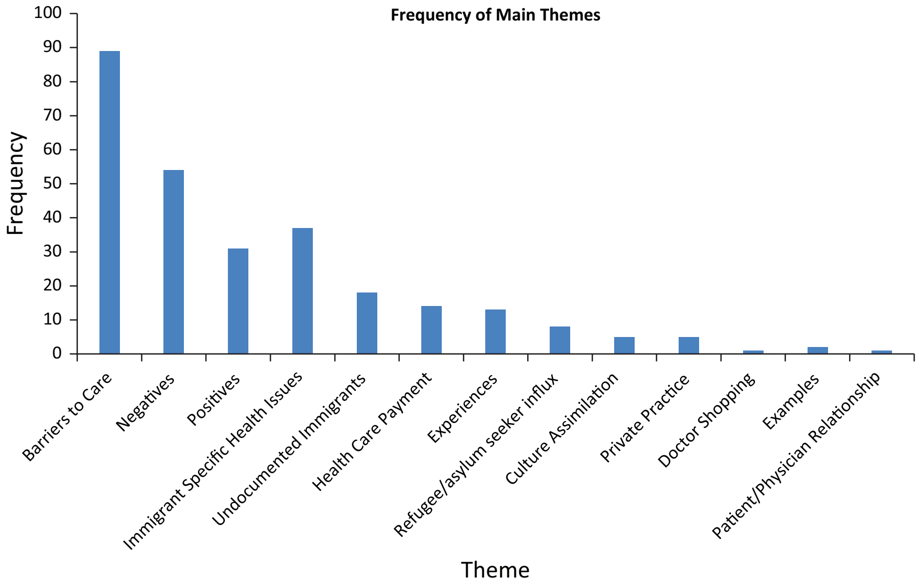

Figure 1.

> me and she or he can speak Norwegian fluently, then we don't have a problem and they get the help they need….

'Translation services' was the most frequent subtheme of language barriers. This service is a right for those seeking healthcare in Norway; however, participant stated that immigrants are frequently unaware of this right. One participant said, '[If] I'm new in Norway, I don't know that I have the right to a translator and my GP (general practitioner) doesn't tell me that you have a right'.

Inadequate health literacy was another common barrier to care. One participant stated, '[We have a] lack of what we call as health literacy. Lack of information not only for the user but for the healthcare provider as well'. Immigrants' misinformation, lack of information, and lack of awareness of their rights with regard to healthcare were frequently reported. One participant stated: 'everyone doesn't know how to demand their rights and, in addition to that, in order to demand your rights, you also have to be aware of these rights, and even when you're aware of the rights, it's not always that you get what you need'. Another participant added:

> I worked in a densely populated immigrant area and many of them wanted practical solutions for practical problems and they wanted it to happen right now. They wanted medication to fix whatever and very often that was quite the wrong solution. So many people would call that lack of health literacy.

Lack of cultural competency in the medical field was another main barrier to care. One participant stated, '... many doctors and nurses, they have very little experience working with people from different cultures'. Study responses suggested a lack of understanding and/or education on the cultural norms of various ethnic groups. Participant explained the importance of increasing cultural competency as Norway becomes more diverse. One ethnically Norwegian participant mentioned creating and attending a monthly cooking class for a specific immigrant population with the goal of improving cultural competency and establishing patient trust.

Some participants discussed the importance of having healthcare providers of the same cultural background to facilitate communication. They expressed that a shared cultural background makes patients feel as if their beliefs and customs are understood, especially when discussing sensitive topics. The subthemes of barriers to care are depicted in Figure 2.

Negatives

Timeliness was the most often identified negative factor of the Norwegian healthcare system. Many participants discussed significant wait times for appointments with healthcare providers, particularly specialists, and how this negatively affected care and experience. One participant stated, 'But many people […] complain about [...] the waiting system [...] when a GP refers to a specialist sometimes they have to wait for 6–7 months […] so it's a long time'.

Lack of resources was another negative factor described by many participant. Some participants felt that there are not enough specialists available in Norway. Rural areas with smaller populations were described as having limited access to specialist services, thereby necessitating travel to major cities to see these specialists. Others described a lack of resources for specific immigrant populations. One participant stated, '[…] some of our therapists must be in some way dedicated to work towards migrants. We need a bit more specialization [for these] patient groups'.

Difficulty navigating the system was frequently mentioned. One participant stated, 'You will find some information about the healthcare system on the Internet, but it is not enough to navigate comfortably within the system'. The many regulations of the Norwegian system were described as a cause of this difficulty. One participant said, 'And then the Norwegian system is very regulated. There are a lot of rules about how to behave within the healthcare system. When you are new in Norway, it is very difficult to find out all the rules and all of them are not written down'.

Lack of patient-centered care was also mentioned. This was discussed as especially problematic for immigrants who come from countries with different healthcare systems. One participant gave the example of an immigrant patient who expects to have all of his or her issues addressed in a 15-min visit, and the issue of computers interfering with the patient–physician interaction. They stated, '[the physician is] typing in whatever you are telling them. So many patients are not satisfied. They think that the doctor is not having any eye contact […] He or she is not listening to us. They are more concerned about writing whatever we are saying…'.

Immigrant-Specific Health Issues

Participants were asked to identify specific health issues among immigrant populations. Chronic disease was mentioned most frequently, especially diabetes. One participant said, 'Diabetes is a problem […] there's been a focus on diabetes and the increase of diabetes within certain groups, ethnic groups or immigrant groups […] We know that Africa, and Asia to a certain extent, is over-represented when it concerns diabetes […]'. This participant stressed the importance of reaching out to these groups to 'provide the necessary information when it concerns diets, exercise, etc.'

Mental health was also frequently mentioned. Many participants felt that previous trauma or hardship predisposes individuals to develop post-traumatic stress disorder, depression, or addiction. One participant stated, 'Almost 80% of patients with PTSD also have a depression, so, it's important to actually be able to handle both things at the same time. And 60% of them often have an addiction problem, so these comorbidities are very important'.

Positives

Many participants identified universal coverage as the best part of the Norwegian healthcare system. One participant stated, 'everyone gets free medical care, I would say that's the biggest pro. You don't need money, you don't need insurance, you don't need anything. You just need to be human'. Another participant stated, 'Our view on the patients and the people we treat [is that] they are all equal. They deserve good treatment and I think that's the main [thing] underlying the whole healthcare system'. Some participants discussed how this sentiment is true on paper but does not always hold true in reality. One participant stated, 'I think the positive is the universal access healthcare system compared to the United States, and many other countries. That in principle as long you have permission to stay, everybody has the same rights for healthcare, but that's in principle'. Participants discussed how legal status affected the implementation of universal coverage. They stated that legal immigrants receive full healthcare access after being in Norway for 6 months, but undocumented immigrants have no coverage at all except for emergency services. One participant said, 'We have universal access, but not for those who don't have staying permits. This is an issue'. Some providers discussed seeing undocumented immigrants in their clinics for little or no cost.

DISCUSSION

Based on the results discussed above, three areas that should be looked upon to increase immigrant healthcare access are universal coverage, language, and cultural competency of providers.

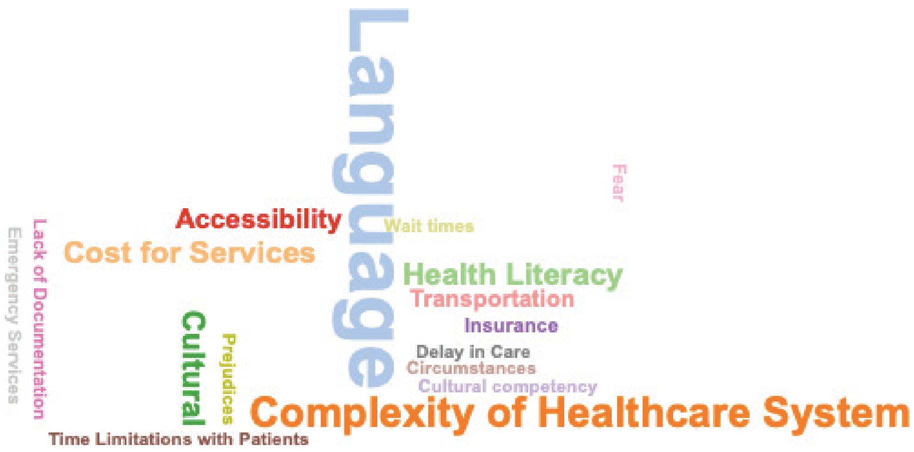

Figure 2. Word cloud representing subthemes of the main theme "Barriers." Language was the most frequent; this is depicted by the word "language" being the largest in size.

Universal Coverage

Universal access was cited as the most important positive factor of healthcare system in Norway; however, many participants stated that this universality was only true on paper. As stated above, undocumented immigrants are left out of this universal coverage as are immigrants who have not been in the country for more than 6 months. The next step will involve discussing ways to increase healthcare access to those who are currently left out of the system. As mentioned in the 'Results' section, some providers attended undocumented immigrants in their clinics for little or no cost. Although this may be helpful to select individuals in the short term, this is not a long-term solution, is provider-dependent, and does nothing to further the accessibility to healthcare for those without legal status. Free healthcare clinics may be another way to improve healthcare access for immigrants in a way that is less secretive than providers in clinics. These clinics would depend on volunteer physicians and would require that immigrants are comfortable seeking out these clinics without fear of being reported. Immigrants would require education on how and where to access these services. For a more permanent solution, it will be required that the Norwegian government decides how it will view undocumented immigrants and their healthcare access when moving forward. Ethical questions of access balanced with the cost to the system must be considered. Even for immigrants with legal status, it is apparent that increased education needs to be provided to inform them of their rights (to translation, etc.) and explain how to better access the healthcare system. Organizations carrying this out may find it advantageous to utilize members of these communities to better access specific immigrant populations.

Language

Addressing the language barrier is essential for improving healthcare for immigrant populations. A Norwegian study found that language barriers amplify the difficulty immigrants face when understanding the healthcare system, resulting in lack of confidence in general practitioners and increased emergency room visits.[10] Previous studies have found that communication between doctors and immigrant patients is problematic.[10,11] One study found that translation services are often difficult to access. A study on immigrant access to healthcare in Denmark found that 'access to interpreters' was the most important factor in best practice.[12] An important solution in increasing immigrant healthcare access will be increasing the number and accessibility of translators in Norway.

Furthermore, immigrants must be educated about their rights to a translator and how to request one when necessary. A language barrier in itself may decrease the ability of a non-Norwegian-speaking immigrant to advocate for his or her right to a translator. Thus, it must also be the responsibility of healthcare professionals to provide these services as the need arises. In-person, well-trained healthcare translators would also be a beneficial addition to healthcare systems.

Cultural Competency of Providers

Healthcare providers in Norway lack experience with a diverse patient population, leading to suboptimal care for these groups. A study on immigrant health in the European Union found that differences in cultural expectations greatly impeded the access to and delivery of healthcare for immigrants.[13] Another study found that general practitioners do not consider cultural differences when working with patients of different cultural backgrounds and suggests that improved cultural competency could improve understanding and communication.[14] Providers should be encouraged to gain an understanding of the cultural norms of immigrant populations whom they frequently interact with. Formal education may also be provided by employers to increase provider knowledge of diverse cultural norms. As one participant discussed, taking time to get to know diverse populations in a relaxed, social setting (i.e., cooking) may improve cultural competency and increase trust.

Study Limitations

This study had a small sample size (16), with the majority of participants being from Oslo, a large city and the capital of Norway. This small sample size is a limitation of the study in terms of generalizability. In addition, it is not known how participants in this convenience sample differ from those who did not participate in the study.

A minor language barrier was present throughout the interviews as English was a second language for most participants. Meanings could be interpreted differently due to this second language component as well as colloquial differences in English. This study relied on self-reporting, and some details may suffer from recall bias. Participant opinions are subjective which may not represent current legislation and policy at large.

This study was qualitative in nature, resulting in subjective interpretation by the researchers when analyzing and coding the interview data. This was minimized by individually coding the interviews but then basing final codes on a group consensus.

CONCLUSION

This study is important because there are no published studies examining access to healthcare for immigrants in Norway based on the experiences of experts in the field. The study suggests that there are a few main topics that can be addressed to provide better care for both documented and undocumented immigrants in Norway in order to come closer to achieving the WHO goal of equitable healthcare for all.[2]

The main topics to address include universal coverage for immigrants, language barriers affecting healthcare, and the cultural competency of providers. Most of the participants agreed that Norway has better healthcare policies for immigrants than other countries, as undocumented immigrants have access to emergency services and documented immigrants have access to primary care services after a waiting period. Unlike documented immigrants, undocumented immigrants never obtain access to primary care services. This presents an issue for the Norwegian healthcare system. In addition, language is a major barrier for many immigrants seeking healthcare services. Translation services is a practical area that needs improvement. One solution is to have well-trained, in-person medical translators available in healthcare settings. Finally, cultural competency is an issue in the Norwegian healthcare system as healthcare providers may not have a comprehensive understanding of certain patient's cultures. Healthcare systems could focus on providing additional cultural competency training to healthcare providers, especially regarding immigrant populations that are more commonly encountered.

This study is applicable to Norway and the Norwegian healthcare system but may also provide information about other developed countries with similar challenges in providing equitable care to increasingly diverse populations.

FUTURE RESEARCH

This study did not focus on meaningful and practical solutions for healthcare issues immigrants face in the short or long term. Further studies should include solution development. It would be beneficial to conduct this study in other countries with both similar and diverse healthcare systems and immigration policies to assess how various countries are handling these issues. Research is also needed to investigate the perceptions of the healthcare system from the viewpoint of the immigrant populations themselves.

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Opioid Safety Education in Adolescent Students

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Purpose: *Opioid overdoses profoundly impact thousands of families across the United States. Behind this issue lies the accessibility of opioid prescriptions right inside our medicine cabinets. Our goal was to educate adolescent students in Kentucky schools about this matter because they comprise a vulnerable population.*

Methods: *Pre- and posttestings were used to analyze 26 adolescents' knowledge, attitudes, and awareness regarding opioid overdoses pre- and post-intervention.*

Results: *Adolescents displayed significantly improved results from pre-test to post-test. Overdose Knowledge scores improved by 16% from pre- to post-intervention ($p = 0.01$). Attitude to Act scores improved by 35% ($p = 0.03$). Drug Disposal Awareness scores improved by 54% ($p < 0.01$).*

Conclusions: *This study demonstrates that education improves adolescents' opioid overdose knowledge, attitudes, and awareness. The evidence shows that there are educational gaps that should be filled by teaching adolescents about the opioid epidemic and providing them with resources.*

Keywords: *opioid; overdose; safety; education; adolescent*

INTRODUCTION

Opioid overdoses have affected countless families across the United States, particularly in the past 20 years. From 2002 to 2017, there was a 4.1-fold increase in total number of opioid overdose deaths and 7.6-fold increase in total number of heroin overdose deaths.[1] In 2017, deaths due to fentanyl/fentanyl analog overdoses accounted for nearly 30,000 of 72,000 drug overdose deaths.[1] Compared to any other substance, fentanyl/fentanyl analogs contributed to the highest increase in drug overdose deaths from 1999 to 2017.[1] Fentanyl is approximately 50 times more potent than heroin and 100 times more potent than morphine.[2] Carfentanyl is about 10,000 times more potent than morphine.

For adolescents aged 15–19 years, the opioid overdose death rate more than tripled from 1999 to 2007; overdose death rates for this population were highest for opioid drugs, specifically heroin, from 1999 to 2015.[3] In 2013, Kentucky had the second highest age-adjusted drug overdose death rate in the United States, with pharmaceutical opioids remaining the primary cause.[4] Of these deaths, 87% were declared unintentional or accidental.[4] Street drugs are not the only threat; in fact, at least half of all opioid overdose deaths involve a prescription opioid.[5] Pharmaceuticals forgotten inside household medicine cabinets pose a threat to children and families who can access these addictive and lethal substances.

In order to help combat this problem, naloxone has become widely available to healthcare professionals, law enforcement, and the community. Naloxone is accessible in local drugstores, but individuals at high risk of witnessing an overdose, such as adolescents, must be educated. One of our primary goals was to familiarize adolescents with naloxone and how it can be used to help save lives. In addition to general education on opioids and its effects, we hoped to provide adolescents with the knowledge and skillset required to intervene if confronted with an opioid overdose.

A range of efforts has been employed to address the opioid crisis. Past studies in adults have demonstrated that opioid knowledge and attitudes can improve with take-home naloxone training,[6] emergency department interventions,[7] and access to overdose resources.[8] Opioid safety education has been implemented in a variety of settings; however, to our knowledge, none has involved educating adolescents in classrooms where they are most accustomed to learning. Our primary outcome was to investigate whether in-school education has a significant impact on opioid overdose knowledge, attitudes, and awareness in adolescents.

METHODS

Selection and Description of Participants

Adolescents have been especially impacted by the opioid crisis and thus were chosen as the subject population of our study. We used pre-/post-testing to analyze the knowledge, attitudes, and awareness of adolescents (*n* = 26) regarding opioid overdoses. In order to focus on this population, we set an age requirement of 12 to 25 years old. Subjects were not excluded based on ethnicity, race, gender, or health status (e.g., pregnancy). They had a mean age of 15.3 years and came from different racial backgrounds: White, African American, and Hispanic.

In order to address a diverse and at-risk population, subjects were pooled from three Kentucky schools: The Learning Center (TLC), Family Care Center (FCC), and Highlands High School (HHS). These schools were chosen based on the willingness of the faculty and administration to facilitate the study in our subject population. TLC and FCC are alternative schools located in Lexington, KY (Fayette County). HHS is a public high school located in Fort Thomas, KY (Campbell County). Fayette County and Campbell County are ranked #2 and #3, respectively, of 120 Kentucky counties for heroin- and fentanyl-related deaths. Campbell County is also #5 in KY for overall overdose deaths.[9]

Technical Information

Under protocol, IRB approval was obtained. Once fully informed of the objectives of the study, willing students aged 18 years or above were consented. If they were under the age of 18, student assent and parental consent were required. Either during or after school hours, all subjects were set up in classrooms to take the pretest Opioid Safety Household Assessment (OSHA), which consisted of three sections: Overdose Knowledge, Attitude to Act, and Drug Disposal Awareness. These questions were assimilated by the principal investigator and her faculty mentor, a child and adolescent psychiatrist. They assessed general opioid overdose knowledge, confidence to act in an overdose encounter, and awareness of drug disposal sites. Additional OSHA information is presented in Table 1.

TABLE 1. Opioid Safety Household Assessment questions.

Sample overdose knowledge statements	Answer choices
Opioid overdose deaths in Kentucky are becoming less common every year.	True, False
Liver, kidney, or heart disease might increase someone's risk of an opioid overdose.	True, False
The main cause of opioid overdose deaths is slowed breathing.	True, False
A person who has overdosed on opioids will look very awake and be breathing fast.	True, False
If naloxone is given to someone who is *not* having an opioid overdose, it will hurt them.	True, False
Attitude to act statements	
If I came across an opioid overdose, I would be able to recognize it and seek help.	Not at all, Disagree, Neutral, Agree, Strongly Agree
I feel confident in my level of training on opioid overdoses and naloxone use.	Not at all, Disagree, Neutral, Agree, Strongly Agree
I would feel comfortable using naloxone if I came across an opioid overdose right now.	Not at all, Disagree, Neutral, Agree, Strongly Agree
I am willing to act in any possible way that could help someone who has overdosed on opioids.	Not at all, Disagree, Neutral, Agree, Strongly Agree
Drug disposal awareness statements	
I know that there are places where I can drop off or throw away drugs.	Not at all, Disagree, Neutral, Agree, Strongly Agree

Note: OSHA consisted of 15 questions divided into three sections: Overdose Knowledge (10), Attitude to Act (4), and Drug Disposal Awareness (1).

Upon completion of the pretest, a research team member delivered a 10-min Microsoft PowerPoint presentation on opioids, including types, recognition of an overdose, and how to respond. Finally, the students completed the posttest OSHA, which consisted of the same questions as the pretest. The Overdose Knowledge scale scored one point for each correct true/false answer and zero point for each incorrect/incomplete answer. The Attitude to Act and Drug Disposal Awareness scales scored based on the level of agreement: 0 = not at all/incomplete, 1 = disagree, 2 = neutral, 3 = agree, and 4 = strongly agree. Each student received a pretest and posttest score in the three areas of Overdose Knowledge, Attitude to Act, and Drug Disposal Awareness.

Statistics

Two of six Attitude to Act statements were eliminated from the OSHA prior to data analysis due to irrelevance and unclear wording. These related to prior education on other substances and naloxone training. Results from the other four statements were used in the statistical workup. Students' pretest and posttest scores were summed to give a total pretest and posttest score in each of the three areas. Differences in summed scores between pretest and posttest were evaluated using the paired sample *t*-test in Microsoft Excel. A cut-off value of $p < 0.05$ was used to determine whether the results were statistically significant.

RESULTS

Twenty-six adolescent students' pretests and posttest scores were used to calculate results. During scoring, we discovered that five students omitted one or more answers to various questions on the OSHA. All omitted answers simply counted for zero points toward scoring. Overall, 21 of 26 students provided answers to every question on both the pretest and posttest OSHA. The highest possible score per subject on the OSHA was 38.

For Overdose Knowledge, the summed pretest score for all participating subjects was 177. The summed posttest score was 205. This represents an increase of 28 points (or 16%) post-intervention. The paired sample *t*-test revealed a statistically significant increase in summed scores from pretest to posttest ($p = 0.01$).

For Attitude to Act, the summed pretest score for all participating subjects was 190. The summed posttest score was 257. This represents an increase of 67 points (or 35%) post-intervention. The paired sample *t*-test revealed a statistically significant increase in summed scores from pretest to posttest ($p = 0.03$).

For Drug Disposal Awareness, the summed pretest score for all participating subjects was 50. The summed posttest score was 77. This represents an increase of 27 points (or 54%) post-intervention. The paired sample *t*-test revealed a statistically significant increase in summed scores from pretest to posttest ($p = 0.0005$).

Figure 1 depicts a graphical representation of pretest and posttest scores for each section of the OSHA.

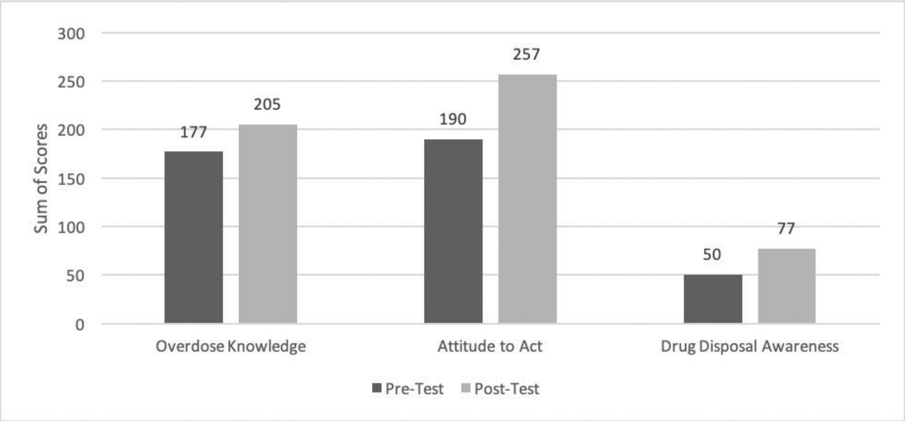

Figure 1. Summed pretest and posttest OSHA scores. The figure depicts sums of 26 adolescents' pretest and posttest OSHA scores. Scores increased from pretest to posttest, with statistical significance in all three sections: Overdose Knowledge ($p = 0.01$), Attitude to Act ($p = 0.03$), and Drug Disposal Awareness ($p = 0.0005$).

DISCUSSION

In this study, students' posttest scores significantly improved from pretest scores in all three OSHA sections. This is an important demonstration of the impact that basic education can have on improving awareness of a public health crisis. We used a 10-min Microsoft PowerPoint presentation to deliver the intervention, which provided a brief yet comprehensive overview of opioid overdoses. We believe that this information would be helpful not only to adolescents but also to families of at-risk individuals going forward. In the future, studies incorporating education to both adolescents and their families would be ideal.

One of the primary limitations of this study is its small sample size due to the challenge of obtaining parental consent for adolescents. Many consent forms were lost or not signed. These students who were under 18 years old could not participate. Because five subjects omitted one or more answers on the pretest or posttest, we did not have a complete data set for scoring. In order to increase generalizability, more studies with larger sample sizes should be conducted. In addition, studies outside of the state of Kentucky would provide a different perspective regarding the impact of opioid overdose education.

CONCLUSION

Although posttest score improvement was statistically significant in each OSHA section, the study's low sample size is a significant limiting factor. Prior studies discussed above have demonstrated the impact of opioid safety education with adults in various settings. These studies embraced different methods, such as conducting in-person interviews or providing take-home naloxone training. Several other studies have demonstrated the impact of opioid education paired with pre- and posttesting. Our study attempted to apply this approach in adolescents, but a larger population of subjects is needed.

Speaking frankly about opioid overdoses in classrooms across schools in Kentucky has demonstrated that adolescents will listen and learn. Expanding opioid overdose education to different states in other settings, such as clinics and community centers, could impact this impressionable population at an even greater magnitude. The opioid crisis will likely remain a threat for many years to come, but steps can be taken to limit its consequences. This study has demonstrated that educating, bringing awareness, and providing resources are important in helping adolescents understand opioid overdoses and how to prevent them.

Conflict of interest and funding

The authors have not received any funding or benefits from industry or elsewhere to conduct this study.

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Comparing Student Satisfaction with Traditional and Modular Group Peer-Tutoring Session

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Background: *Our allopathic medical school has utilized a peer-tutoring program since inception in 2011, where second-year medical students teach first-year students in 2-h lecture-style review sessions. In 2015, an alternative format was implemented using four, repeating 30-min modules. This study was designed to compare student satisfaction with both approaches.*
Methods: *An online survey was emailed to students graduating in 2018 (n = 97) and 2019 (n = 127).*
Results: *A total of 72 (32.6%) responding students were included in the study, 35 from the class of 2018 (Co2018) and 37 from the class of 2019 (Co2019). Fewer Co2018 students, who received traditional instruction, were 'very satisfied with the session timing' compared with Co2019 students, who received the modular format (proportion difference: 0.42; $P < 0.001$, 95% confidence interval [CI] [0.21–0.63]). Co2018 students were more likely than Co2019 students to stop attending because their time was better utilized another way (proportion difference: 0.22; $P = 0.054$, 95% CI [-0.003 to 0.45]).*
Conclusions: *Students preferred the session length and timing of the modular format. Future studies are warranted to evaluate the effectiveness of this approach.*

Keywords: *education; medical; teaching; tutoring*

INTRODUCTION

Peer-teaching is widely regarded for benefits to both the student and tutor while simultaneously reducing the teaching burden for faculty educators.[1–4] Students who receive tutoring indicate the greatest benefits include hearing alternate explanations of concepts, learning how second-year medical students approach course content, and making conceptual connections between topics.[5] In addition, medical schools may utilize peer-tutoring to help prepare students to be future medical educators.[6] However, very little research exists in the realm of peer-tutoring in health professional schools to evaluate the effectiveness and student satisfaction of the peer-tutoring format.[7]

Oakland University William Beaumont School of Medicine (OUWB) is an allopathic medical school founded in 2011 with a current enrollment of 125 students per year. During the first semester, students encounter basic concepts in Anatomical Foundations of Clinical Practice (AFCP) and Biomedical Foundations of Clinical Practice (BFCP); these foundational courses support subsequent organ system courses taken throughout the remainder of the first and second year. Since our inception, the Director of Academic Success at OUWB has overseen the peer-tutoring program that employs second-year medical (M2) students to provide weekly individual and group tutoring for first-year medical (M1) students in AFCP, BFCP, and organ system courses. Before the Fall 2015 semester, the peer-tutoring sessions for BFCP followed a traditional lecture-style review format, which covered all relevant topics taught in the previous week. Designated topics were presented in a consecutive fashion by different tutors. While this format was beneficial to many M1 students, drawbacks included lengthy sessions, lack of student engagement, and an intimidating environment to ask questions. To resolve some of these issues, an alternative format was used to cover BFCP course material in 2015, where four, independent, 30-mi 'modules' were delivered simultaneously, repeating over the 2-h session. This allowed M1 students to attend the topics in any order, attend the same module more than once, or leave once their questions were answered.

This study was designed to evaluate student satisfaction for the new modular peer-tutoring approach in comparison to the traditional lecture format. We hypothesized that M1 students would prefer the modular format for several reasons, including decreased session length, increased participant autonomy, and increased engagement.

METHODS

Subjects were OUWB medical students graduating in 2018 (*n* = 97) and 2019 (*n* = 127), the two most recent cohorts to attend the peer-tutoring sessions. An electronic survey was created through Qualtrics® and emailed to all subjects in Fall 2016. The class of 2018 (Co2018) attended traditional group peer-tutoring sessions consisting of consecutive lectures; the class of 2019 (Co2019) attended the new session format that utilized repeating 30-min modules. Demographic information was collected to identify potential differences between student academic majors and degrees, attendance, and experiences with the peer-tutoring sessions. Students were asked for their opinions regarding the format of the peer-tutoring sessions they attended. In addition to multiple choice and Likert scale questions, all participants were given the opportunity to answer free response questions to further compare student satisfaction with the new peer-tutoring method.[8] The study was submitted under exempt status to the Oakland University Institutional Review Board and received approval.

STATISTICS

Chi square and two proportion tests were used to compare responses between the two cohorts; when samples were small, Fisher's exact test was used (denoted by[†]). All tests were two sided; we used a cutoff of $\alpha = 0.05$ to determine significance. Analyses were performed using Minitab 17 (Minitab Inc., State College, PA).

RESULTS

A total of 72 (32.6%) students completed the survey, 35/97 from the Co2018 and 37/127 from the Co2019. Summary data for the survey is included in Table 1. Twenty-nine percent (10/35) of students from the Co2018 were very satisfied with the timing of the session, compared with 70% (26/37) of students in the Co2019 (proportion difference: 0.42; $P < 0.001$, 95% confidence interval [CI] [0.21–0.63])[†]. Sixty-seven students (93%; 95% CI [0.85–0.98]) reported they used the sessions primarily to supplement lecture materials or ask

Table 1. Selected survey results and associated chi square analyses comparing the traditional (class of 2018) and modular (class of 2019) review format.

Question	Response	Class of 2018		Class of 2019		*P*
		n	(%)	*n*	(%)	
Age	<27	28	(80)	28	(76)	0.659
	27+	7	(20)	9	(24)	
Biological science educational background	Yes	22	(63)	30	(81)	0.084
	No	13	(37)	7	(19)	
Attendance at tutor-led review sessions	<25% of the time	11	(31)	9	(24)	0.355
	25–75% of the time	17	(49)	15	(41)	
	>75% of the time	7	(20)	13	(35)	
How much did you rely on peer-review sessions to learn material in BFCP?[a]	Only to ask small questions	3	(9)	5	(14)	0.466
	Teach myself some/most of the material	3	(9)	1	(3)	
	Supplement or reinforce understanding of material	28	(82)	31	(84)	
Please rate your satisfaction with the overall timing of the session	Far too long	4	(11)	0	(0)	<0.001
	Somewhat too long	18	(51)	3	(8)	
	Somewhat short	3	(9)	8	(22)	
	Very satisfied with the timing	10	(29)	26	(70)	
Please rate how engaging the review sessions were	Not at all or rarely	4	(11)	1	(3)	0.179
	Somewhat	19	(54)	17	(46)	
	Very	12	(34)	19	(51)	

[a] One respondent from the class of 2018 failed to respond to this question.

clarifying questions, as opposed to using the sessions as a replacement for lectures. There were no statistically significant differences between the Co2018 and the Co2019 regarding the reasons for attending the review sessions.

Student responses to aspects of review sessions that should be 'stopped, started, or continued' are found in Table 2. When asked why students stopped attending review sessions, students in the Co2018 (9%; 3/35) were less likely than the Co2019 (24%; 9/37) to stop attending because they did not need the material explained a second time (proportion difference: 0.16; *P* = 0.11, 95% CI [-0.01 to 0.35])†. Students in the Co2018 (60%; 21/35) were more likely than the Co2019 (38%; 14/37) to stop attending because their time was better utilized another way (proportion difference: 0.22; *P* = 0.054, 95% CI [-0.003 to 0.45]). When asked which aspects of the session were not helpful and should be discontinued, session length was mentioned by 20% (7/35) of the Co2018, but not mentioned by any respondents from the Co2019 (proportion difference: 0.20; *P* = 0.005, 95% CI [0.07–0.33])†.

DISCUSSION

Many studies have shown that peer-tutoring is an effective tool to improve student learning, both for the students and their peer-tutors.[1–4] While the literature supports the value of peer teaching in medical education, there is limited information in regard to the ideal peer-tutoring program format. Our study evaluated student satisfaction of a unique modular peer-tutoring approach compared to a more traditional peer-tutoring format.

We found a statistically significant difference in student satisfaction with session length between the two formats, where students who participated in the modular format were more likely to be satisfied with the session timing. Although the traditional approach followed a 2- to 3-h lecture-style format covering all topics, the modular approach allowed for more flexibility, with four, 30-min sessions focused on the material that the M1 students had previously indicated they needed the most assistance with. Students who attended the traditional format were more likely to say that session length was too long, as well as stop attending because they believed their time could be better utilized. Time is an extremely valuable asset for medical students, in which studying for examinations, community service, and research are only a few of the activities that often fill their day. In addition to keeping the review sessions to a strict 2 h, the modular peer-tutoring format also allowed students to determine how long they needed to stay to cover concepts they were struggling with, as opposed to the linear format of the traditional sessions. This may have helped students utilize their time more effectively and efficiently, and increased student satisfaction with this format.

Increased engagement is another potential reason for student satisfaction with the modular format. For one, students may have felt that it was easier to successfully learn important concepts during a shorter 30-minute session. According to the AMEE Medical Education Guide, attention fluctuates throughout a 1-hour lecture, and students often experience a marked decline in attention after the first 20 min.[9] As the student cohort was divided spatially into four different modules, there were fewer students per tutor, potentially allowing for closer seating, increased participation, and less intimidation when asking questions. In addition, students

Table 2. Comparing the top responses for the 'start, stop, continue' series of questions between the traditional (class of 2018) and modular (class of 2019) review format.

Question	Top responses	Class of 2018		Class of 2019		Difference	95% CI	*P*[a]
		n	(%)	*n*	(%)			
Stop	Nothing	7	(20.0)	12	(31.6)	0.12	[−0.31 to 0.08]	0.253
	Length of session	7	(20.0)	0	(0.0)	0.24	[0.07–0.33]	0.004†
Start	More practice questions	4	(11.4)	6	(15.8)	0.04	[−0.20 to 0.11]	0.738†
	Nothing	5	(14.3)	3	(7.8)	0.06	[−0.08 to 0.21]	0.468†
Continue	Handouts	16	(45.7)	12	(31.6)	0.14	[−0.08 to 0.36]	0.211
	Time to ask questions	5	(14.3)	5	(13.2)	0.01	[−0.15 to 0.17]	0.889

[a] Difference between two sample proportions.
† Fisher's exact test was used.

could choose which sessions to attend based on the material covered, attend the same module multiple times, or leave the session between modules once they felt comfortable with the material. These themes appeared as some of the most common responses to the open-ended 'start, stop, continue' questions (Table 2). Generally, students wanted to 'start' seeing more practice questions, and 'continue' being provided with handouts and opportunities to ask questions. The only common 'stop' response was with respect to session length, and this was only observed with the Co2018.

One potential limitation of this study was recall bias, in which students from the Co2018 completed the survey approximately 2 years after completing their last tutor session. Our cross-sectional study did not employ random sampling, and lacked associated grade data; thus, we were unable to make claims regarding the similarity of the two sample populations. Sample size was also a concern for statistical significance, as our cohorts were limited by class size and participation, which may have introduced an element of response bias. Finally, we recognize the possibility that the review format influenced the sample populations by selecting for students preferring that particular setting; the traditional style was passive, while the modular format included active learning. Our study showed that medical students preferred the session length and timing provided by the modular peer-tutoring approach. Based on these results, we feel that future studies are warranted to further evaluate the effectiveness of this approach.

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