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Hospitalists' Needs Assessment and Perceived Barriers in Wound Care Management: A Quality Improvement Project

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Abstract

The purpose of this quality improvement (QI) project was to determine hospitalists' knowledge, practices, and perspectives related to management of pressure injuries (PIs) and neuropathic/diabetic foot complications (having a foot ulcer or subsequent development of a foot infection because of a foot ulcer). We also sought to identify resources for and knowledge-based barriers to management of these wounds. This QI effort targeted an inter-disciplinary group of 55 hospitalists in internal medicine that consisted of 8 nurse practitioners, 10 physician assistants, and 38 physicians. The site of this initiative took place at the Johns Hopkins Bayview Medical Center, a 342 bed academic hospital located in the MidAtlantic United States (Baltimore Maryland). The first phase of our QI project comprised an on-line survey to identify hospitalists' knowledge, practices, and opinions on inpatient management of PIs and diabetic foot complications. The second phase involved semi-structured focus groups attended by hospitalists to identify resource gaps and barriers inferred by survey results. Twenty-nine of 55 (52%) hospitalists responded to the survey; 72% indicated no formal training in wound care. Over 90% had little to no confidence in management of PIs and diabetic foot complications. In a separate ranking section of the survey, respondents selected lack of knowledge/confidence 12 of 29 (41.3%) and resources 9 of 29 (31.0%) as number one barriers to wound care. Managing obese patients with was identified as a second major barrier from 10 of 29 selected options (34.5%). Eighteen of 55 (33%) hospitalists attended focus group sessions acknowledging barriers to wound care that included provider education, information technology, system factors, and interprofessional engagement. Attendees welcomed additional educational and ancillary resource support.

Keywords

Hospitalists; Diabetic foot ulcer; Diabetic foot infection; Pressure Injury; Pressure ulcer; Quality Improvement; mixed methods

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Introduction

According to the Agency for Healthcare Research and Quality (AHRQ), pressure injuries (PIs) affect 2.5 million individuals, and cost \$9.1–11.6 billion dollars annually in the United States (US)¹. Each year, more than 60,000 deaths and almost 20,000 lawsuits are attributable to PIs. Today, hospitals have increased expectations to recognize and manage PIs, and following October 2008, the Centers for Medicare and Medicaid services changed their policies for reimbursement of additional costs associated with hospital acquired PI². Therefore, it is essential that hospital providers are knowledgeable in recognition and prevention of PIs.

Similarly, diabetic foot ulcers are pervasive in the United States with healthcare costs ranging between \$9-\$13 billion dollars per year^{3,4}. Patients with diabetic foot ulcers have high morbidity associated with diabetic foot infections and amputations.^{4,5} We described diabetic foot complications as patients either having a diabetic foot ulcer or an underlying infection because of having a diabetic foot ulcer. The long-term prognosis following amputation is poor with a 5-year mortality of over 45%.⁵ Hospitalized patients with diabetic foot complications have poor long-term outcomes including ulcer recurrence and amputations, prompting guidance to improve inpatient management.^{6,7} Hence, hospitalists require knowledge of management of diabetic foot complications in order to prevent adverse outcomes and promote limb preservation.

Little is known about knowledge levels of hospitalists in PI, and diabetic foot complication management. We identified 2 studies that commented on minimal formal physician educational initiatives regarding wound care^{8,9}. Patel and Granick studied 50 U.S. medical schools and found that scarce educational resources in wound management curricula was common¹⁰. Yim and colleagues found that only 7 of 55 surveyed medical schools had formal wound care rotations¹¹. Evidence related to the nurse practitioners play in the management of uncomplicated diabetic foot infections is limited, but it also supports specialized training in diabetic foot care.^{12,13} Similarly, for PIs, educational opportunities have been welcomed by nurses to optimize wound care management.¹⁴ We reviewed the literature but found no reports of specialized or formal educational efforts for physician assistance for either PIs or diabetic foot complications.

At Johns Hopkins Bayview Medical Center (JHBMC), hospitalists' knowledge and practice query were stimulated after completion of the Wound Ostomy Continence (WOC) Society's Wound Treatment Associate (WTA) Course™ by two authors (AR and CH) and coordinated by the WOC nurse author (CW). We conducted a mixed methods quality improvement project at our hospital that sought to determine hospitalists' knowledge, practices and opinions regarding PIs and diabetic foot complications. The hospitalists group at JHBMC is composed of an inter-disciplinary team of 55 providers in internal medicine that include, advanced practice registered nurses, physician assistants and physicians. The goal for this project was to identify hospitalists' proficiency in assessment and management of PIs and diabetes foot complications leading to viable intervention to improve quality of care in these populations.

Project Design/ Methods

The QI project setting was the Johns Hopkins Bayview Medical Center, a 342-bed university affiliated hospital in Baltimore, Maryland; data collection for the cross-sectional survey occurred between February 13th, 2018 and March 13th, 2018. Data were collected using a mixed methods design. We surveyed hospitalists in internal medicine, which included physicians, nurse practitioners, and physician assistants. The survey was designed by experts in wound care and focused on provider knowledge, confidence and practices in PIs and diabetic foot complications. The questionnaire comprised 25 items, 20 were forced choice items (rankings or multiple choice) and 5 queried provider demographics. The approximate amount of time needed to complete the survey was 15 to 20 minutes. Provider demographic questions included multiple choice options in number of years in practice, level of formal wound care training, and if applicable, the setting and time period they received training. Queries regarding knowledge, confidence and practice methods were divided into categories of either PI or diabetic foot complications. The survey was investigator developed and was not validated. However, it was piloted with a group of non-hospitalist providers (composed of nurse practitioners, physician assistants and physicians), who offered feedback and recommendations to improve the questionnaire.

Fifty-five hospitalists currently practicing at our medical center were individually invited via e-mail to participate in the survey. The survey link was active for one month (February 13th, 2018 to March 13th 2018), and one weekly reminder was sent after survey distribution. The e-mail invitation explained the purpose of the survey as part of a QI project, instructions, and confirmation that all responses would be confidential. Participant consent to take the survey was explained in the instructions and obtained if they agreed to complete the survey (where completion of the survey was deemed to be consent). The invitation also included an internet link to the survey site under Qualtrics™. Survey participation was voluntary and eligibility criteria included current practice as a hospitalist and providing medical care for those 18 years of age and older. Participants who completed the survey were compensated with a \$20.00 Amazon e-gift card.

After data collection for the survey was completed, two follow up, one-hour exploratory focus group meetings were conducted with replicated facilitator open guided discussion among participants. Both focus groups were facilitated by the three facilitators CW, AR, and CH. The target audience were the 55 hospitalists invited to participate in the survey. The focus groups were conducted within one week of each other, during the last week of April 2018 and first week of May 2018. Hospitalists were compensated with a \$25.00 Amazon e-gift card after participating in either of the two focus groups. Failure to participate in the survey was not an exclusion criterion for those who wanted to participate in focus groups. Each focus group had the same structure that gave participants a general background regarding the purpose of holding the meetings, aims and cumulative, anonymized respondent results from the survey. The meeting targeted questions that addressed barriers and challenges in wound care of PIs and diabetic foot complications based on survey responses. The 2 focus group sessions were recorded and subsequently transcribed for thematic analysis. The institutional review board at Johns Hopkins School of Medicine reviewed the protocol and deemed this project as a Quality Improvement initiative.

Data Analysis

Because of the small sample size, our analysis was descriptive. Statistical software for this project utilized STATA (StataCorp, College Station, Texas) version 15.1 for analysis. We used a thematic analysis approach, which is deemed appropriate when attempting to identify, organize and interpret patterns in data.¹⁵ Localized themes are patterns within datasets that help extract information from questions asked.¹⁶ Transcripts were reviewed by CW, AR, TGJ, and CH. Recurrent concepts from topics were selected, separated into unique categories and finalized by CH.

Outcomes

Table 1 summarizes demographic data of respondents to the survey; 29 of 55 (52%) hospitalists completed the survey. Most respondents reported having 3 or more years of clinical experience (21; 72.4%). There were slightly more females (16; 55.2%), and most were physicians (19; 65.5%). The majority responded that they had not received any formal education (18; 62%) or training (21; 72.4%) in wound care.

Clinical Practice, Confidence, and Knowledge Survey Results

When asked about the wounds they encountered most commonly, most hospitalists selected PI (15; 51.7%) followed by diabetic foot complications (13; 44.8%). Tables 2 and 3 summarize responses regarding confidence and clinical practices in the management of PIs and diabetic foot complications, respectively. Sixty-two percent (18 of 29) rarely or sometimes examined newly admitted bedbound patients for PIs at the time of admission. Thirty-four percent (10 of 29) reported that they regularly (always or mostly) inspect the feet of patients with diabetes mellitus who do not present with diabetic foot complications. For patient presenting with diabetic foot complications, 76% (22 of 29) reported that they typically (always or mostly) examined the unaffected foot. Most hospitalists indicated not having any confidence or only being somewhat confident in the management of Stage 1 to 2 PIs (28; 96.5%), Stage 3 to 4 (28; 96.5%) PIs, and diabetic foot complications (27; 93.1%).

When asked about knowledge in this area of case, 18 of 29 (62.0%) respondents inaccurately indicated that PIs were considered hospital acquired if documented more than 24 hours after hospitalization. In contrast, 80% (23 of 29) selected the correct stage of PI illustrated in an image embedded into a survey item. However, only 14% (4 of 29) correctly selected “deep tissue injury” when shown a characteristic image. Eighty percent (23 of 29) correctly selected “pressure redistribution support surface” when asked about potential PI interventions. Eighty-six percent (25 of 29) accurately chose to “offload/protect evolving pressure injuries” as a best practice strategy. Regarding diabetic foot inspection, 13% (4 of 29) hospitalist team evaluated the feet of diabetic patients routinely who did not report foot ulcerations. Additionally, 79% (20 out of 29) the hospitalist team respondents did not inspect the contralateral foot of those presenting with diabetic foot complications. Four respondents (12%) selected “total contact casting” correctly as appropriate adjuvant management for patients with diabetic foot complications.

Ranked Barriers

Respondents were asked to select and rank up to three barriers to caring for patients with PIs and diabetic foot complications from a list of 8 choices. The most highly ranked barriers selected were lack of knowledge/confidence (12 of 29; 41.3%) and lack of resources (9 of 29; 31.0%), and obesity, defined as individuals with a body mass index ≥ 30 kg/m² (5 of 29; 17.2%). The barriers selected as the second top barrier were again, lack of knowledge and confidence (11 of 29; 37.9%) and obesity (10 of 29; 34.5%). The third top barriers to wound care were communication with nurses (9 of 29; 31.0%) followed by handoffs/communication with medical team members (6 of 29; 20.6%) and not having a 24-hour 7 day per week (24/7) wound care consult service available (6 of 29; 20.6%).

Outcomes of Focus Groups

Eighteen of 55 hospitalists (33.7%) attended one of the 2 focus groups. Eight of 55 (14.5%) hospitalists attended the first focus group; most were physicians (7; 87.5%), female (5; 62.5%), and had greater than 5 years of clinical experience (6; 75%). Ten hospitalists (18%) attended the second focus group (one had previously participated in the first focus group). Half of attendees were physicians (5; 50%), mainly female (7; 70%). Half had more than 5 years of experience (5; 50%).

Focus groups were semi-structured, and we noted common challenges encountered in wound care and similar themes between the groups in responses to questions. Key themes were: 1.) assessment and diagnostic challenges, 2.) management of PIs and diabetic foot complications, 3.) systems challenges, and 4.) communication barriers. Table 4 presents selected quotes from the combined focus groups.

Assessment and diagnostic challenges

Analysis from the focus groups revealed that hospitalists experienced difficulty conducting complete skin assessments not only at the time of admission, but also throughout the hospital course. Limitations in mobility and body habitus/obesity status of patients were a hindrance for hospitalists because examination required assistance from first line nursing staff, who were not always present. Because physical examinations were sometimes limited, confirmation for PIs upon admission was difficult at times. Hospitalists were also challenged with sometimes being unable to carry out serial assessment of PIs and diabetic foot complications. Providers described encountering patients whose wound dressings were just changed prior to their assessment, or they described assessments that necessitated assistance from staff who might not be available at the time. Hospitalists suggested uploading pictures of wounds into the patient's electronic medical record to help in the tracking/reassessment process. An additional diagnostic challenge was unavailability of bariatric diagnostic imaging to receive indicated studies to further evaluate extent of wounds for development of abscesses or underlying osteomyelitis. For example, MRI is the imaging diagnostic test of choice to support a diagnosis of osteomyelitis. However, the MRI machines at our hospital cannot accommodate patients that weigh over 205 kilograms (451 pounds).

Management of PIs and Diabetic Foot Complications

Consistent with survey findings, hospitalists reported lack of knowledge and confidence in their ability to appropriately manage both PIs and diabetic foot complications. Hospitalists did not know what types of evidence based wound care options to provide for patients. They cited a lack of familiarity with wound care products and were not certain when and how often to apply specific products. Providers also indicated the need for guidance on when orthopedic, vascular or other surgical teams should be consulted to assist in the patients care. During the focus groups, hospitalists suggested and welcomed educational resources, such as online wound care learning modules and online sites with pictures of wounds in addition to wound care products with instructions on how to use them.

Patients with obesity

Hospitalists reported antimicrobial dosing challenges in patients with obesity when there was concern for an infected wound. Despite not being able to confirm whether suggestion of infection was detected by imaging, hospitalists consistently indicated treating patients significantly impacted by obesity with empiric antibiotics out of caution. Respondents indicated the need for interdisciplinary consultation and coordination with infectious disease specialists, surgeons, and pharmacists. Poor mobility was also noted, and coordination with support staff to help move patients to better assess wounds was proposed.

Systems challenges

This overarching theme was subdivided into two subthemes, barriers to implementation of wound care consultant recommendations, and limited resources. Thematic analysis revealed multiple areas where respondents identified inadequate resources needed to provide optimal care to patients with PIs and diabetic foot complications. Hospitalists reported a lack of transparency of nursing and specialty wound care documentation in the electronic health record. Respondents reported difficulty locating some of the nursing documentation regarding wounds within 24 hours of admission rendering it difficult to reliably determine how long wounds had been present. Additionally, hospitalists also reported problems finding updated documentation of recommendations from wound team members and/or WOC nurses. They reported that they often had to “sift through” multiple progress notes to find the latest wound care team recommendation. Hospitalists identified the need for a more efficient process for tracking wound care notes, and they proposed development of an order set or alternative means for enabling wound care consultants to pend orders to the patient’s charts (our hospital has implemented this type of process for several other consulting teams). Pending orders could then be reviewed and co-signed by the covering hospitalist, reducing delays in wound care management. In addition, hospitalists indicated that a clear set of recommendations for care following discharge provided by the wound consultants was crucial when planning to discharge patients to a skilled facility, home health care agency, or physical rehabilitation facility.

Respondents identified multiple issues that fell into the subtheme limited resources. For example, respondents voiced a need for an inpatient podiatry consultant who could help assist in the management of diabetic foot complications. Furthermore, hospitalists were not aware of local outpatient or in-system wound care follow up sites to refer patients upon

discharge from the hospital. Further discussion determined that there was a local dedicated diabetic foot clinic, but the majority of attendees were unaware of its existence. Other concerns regarding the need to update case management wound care resources were noted. Hospitalists were also concerned about patients who presented with PI or diabetic foot ulcers overnight and over the weekends, as wound care consult service was not available every day and around the clock. Respondents suggested consideration of evening and weekend coverage to help address this issue.

Communication barriers

Thematic analysis revealed a fourth theme to optimal management of PIs and diabetic foot complications, communication barriers. Hospitalists stated they were concerned about timing of wound care dressings changes. They described reluctance to undress a wound that had been recently dressed as this was uncomfortable (possibly painful) and annoying for the patient. A standardized means of communication was suggested to help ameliorate this gap in communication.

Considered collectively, key findings of the focus groups included support teams for optimal patient physical assessments, provider education, information technology and interprofessional engagement. Provider education comprised accessibility to policy, algorithms, product, and support surface formularies. Information technology opportunities were identified regarding wound flow sheet transparency by hospitalists, prompts embedded in templates, photo-documentation, order sets, and wound specialist nurse note enhancements specifically related to discharge planning. Interprofessional engagement centered around communication –electronic, nursing, WOC nurses, case management, and other physician colleagues (i.e. vascular and orthopedic surgeons). The absence of podiatric inpatient care escalated as a critical barrier to optimal diabetic foot management.

Discussion

This single center mixed methods QI project found that hospitalists feel unprepared and have perceived gaps in clinical practice management of PIs and diabetic foot. Limited in-hospital resources, level of wound care knowledge, electronic health record transparency, and staff communication/engagement were the highest reported barriers in optimizing provider wound care management. System factors and patient obesity were identified as barriers to wound care management. Most hospitalists welcomed means to close gaps in their wound care management capabilities. To our knowledge this is the first published QI project that specifically sought to determine hospitalists' knowledge and perspectives in wound care management of PIs and diabetic foot complications.

Out literature search found similar barriers in management of PIs and diabetic foot complications reported in prior studies.^{17,18} For example, Pankhurst and Edmonds surveyed over 400 healthcare providers who attended a Masters Class diabetic foot conference, and determined that lack of resources, communication, and education contributed to delays in management¹⁷. Hence, this may be a common trend in management of diabetic foot complications, which warrants attention and intervention to help improve healthcare outcomes. Another study found that nurses in acute and primary care settings not only

reported lack of knowledge in PI management, but also lack of time¹⁸. In addition, a national cross sectional study that surveyed healthcare providers found that up to 40% of nurses, and over half of physicians and wound consultants did not feel that their facility provided adequate pressure injury prevention education.¹⁹ Our work was different from these two studies in that it targeted only hospitalists and lack of time was not an identified barrier. Also, we found patient obesity status was a notable barrier identified by inpatient providers.

Educational interventions that help providers in wound care knowledge may also potentially serve as means to help bolster provider confidence. For example, online training from available sources such as the Wound, Ostomy and Continence Nurses Society Wound Treatment Associate (WTA) course may be an avenue for educating a broader array of inpatient providers that the hospitalists evaluated in this QI project. Like findings identified from Suva's work, our project found that providers wanted online learning tools²⁰. Also, research has shown that e-learning tools have been effective in the management of wounds, specifically PIs²¹. Ensuring providers are aware of wound care resources requires constant communication between dedicated wound care and inpatient providers. Our hospitalists welcomed a multi-faceted team approach to address PIs and diabetic foot complications where written, verbal and visual communication could be enhanced. Clear documentation with easy accessibility to documents and communication of wound status at the time of admission and throughout the patients' hospital stay is critical to ensure timely management and tracking of wound progress. Moreover, available staff resources to assist in moving patients, especially those greatly limited by debility or obesity may greatly facilitate early recognition and/or adequate assessment of PIs and diabetic foot complications. Not only is this crucial in managing patients to improve health outcomes, but is important in accurate diagnostic coding. For example, pressure injuries noted on admission have significant reimbursement consequences for the hospital. Prompt documentation assists hospitals to better track PIs if they are acquired in the hospital. Similarly, failure to effectively examine diabetic foot complications may lead to suboptimal diagnostic and management of complications, such as osteomyelitis or abscesses.

Addressing obesity status early during the hospitalization, ideally at the point of admission, may possibly help facilitate identification and management of wounds. This will require a multi-disciplinary approach that involves nurses, infectious disease specialists, surgeons, and radiologists. Early and close coordination with radiologists for timing and availability of specialized imaging equipment may be required to accommodate patients with obesity. Obtaining surgical consultants sooner rather than later during the hospitalization may help facilitate indicated bone biopsies in the work-up of osteomyelitis or debridement that may limit and prevent potential aggressive surgical interventions and amputations. Timely acquisition of wound tissue cultures may in turn help in selection of appropriate antimicrobials, and limit or reduce indiscriminate administration.

Strengths and Limitations

We performed a QI project in a single hospital with a target population of 55 hospitalists. As such, our data were restricted to descriptive statistical analysis thus the results are not generalizable. The primary strength of this QI project was identification of major gaps,

barriers, and resource deficits for hospitalists to effectively manage PIs and diabetic foot complications. Anonymized surveys helped identify barriers to effective wound care, and follow up, face to face meetings allowed us to clarify responses from the surveys and think of future strategies to improve care for patients affected by diabetic foot complications.

Implications for Practice

Because PIs and diabetic foot complications are frequently encountered by hospitalists, we engaged interprofessional stakeholders, hospitalists, nursing and WOC nurses to better understand the challenges the hospitalists face. Leadership within the division of Hospital Medicine were also invited and participated in this QI project (by survey response and focus group settings). Also, immediately following our QI project, we reviewed the resultant data and based on these findings addressed gaps that would help hospitalists in their wound care management. For example, CW generated a flow sheet that highlighted the following: “Identified Issues”, “Next Wound Care Team Action Steps” and “Projected Timeline for Next Steps”. This information was disseminated to the hospitalists group and leadership. In addition, AR updated and educated our nursing team on goals set forth as a result of this project (such as communication with providers on dressing changes).

Future investigation at our hospital may involve inpatient provider teams from other disciplines, such as surgery and psychiatry. It is likely that these specialty disciplines may describe different barriers and resource needs when compared to hospitalists. All hospitals have their unique culture and resources, and hence customized surveys and focus groups similar to the ones in our project may help identify site specific needs that may be similar or different from ours.

Conclusions

Hospitalists encounter PIs and diabetic foot complications on a routine basis and must be equipped with essential resources to optimally identify and manage these conditions in acute care settings. Quantitative and qualitative data collection in our facility during this QI project found that limited in-hospital resources, level of wound care knowledge, electronic health record transparency, and staff communication/engagement acted as obstacles to optimal wound care management by our hospitalists. Additional work following this project will focus on interventions to address inpatient provider wound care needs and post assessment follow up with providers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Key Points

1. Limited in-hospital resources, level of wound care knowledge, electronic health record transparency, and staff communication/engagement were the highest reported obstacles in optimizing hospitalists' wound care management.
2. System factors and patient obesity were also identified as barriers to wound care management by the hospitalists.
3. Interventions that provide education and resource information may potentially serve as means to boost provider knowledge and confidence, which may ultimately improve patient clinical outcomes and reduce hospital costs.

Table 1.

Survey Respondent Demographics: (N=29)

	Total	Years of clinical experience		Amount of time received for formal wound care education in hours		
		3 years	<3 years	6 hours	< 6 hours	No training
Clinical Position						
Physician, n (%)	19 (65.5)	17 (89.4)	2 (10.5)	0	4 (21.0)	15 (78.9)
Physician Assistant, n (%)	7 (23.3)	1 (14.2)	6 (85.7)	0	1 (14.2)	6 (85.7)
Nurse Practitioner, n (%)	3 (10.0)	3 (100.0)	0	1 (33.3)	2 (66.6)	0
ALL PROVIDERS n, (%)	29 (100)	21(72.4)	(8)	1(33.3)	7(24.1)	21(72.4)
Gender						
Female, n (%)	16 (55.2)	11 (68.7)	5 (31.2)	3(18.7)	1(6.25)	11(68.5)
Male, n (%)	13(44.8)	10 (77.0)	3 (30.0)	0	4(30.7)	9(69.2)

Table 2.

Practice for pressure injuries: Survey Respondents (N=29)

Confidence in managing Stage I-II pressure injuries					Confidence in managing stage III-IV pressure injuries					Examination of bedbound patients for pressure injuries on admission				How often do you document pressure injuries at the time of admission?			
Ident	Somewhat confident	Confident	Very Confident	Not confident	Somewhat confident	Confident	Very Confident	Always	Mostly	Sometimes	Rarely	Always	Mostly	Sometimes	Rarely		
a)	13 (68.4)	0	0	15 (78.9)	4 (21.0)	0	0	2 (10.5)	5 (26.3)	8 (42.1)	4 (21.0)	4 (21.0)	9 (47.3)	6 (31.5)	0		
b)	4 (57.1)	0	0	6 (85.7)	1 (14.2)	0	0	0	2 (28.5)	3 (42.8)	2 (28.5)	0	4 (57.1)	3 (42.8)	0		
	2 (66.6)	0	1 (33.3)	1 (33.3)	1 (33.3)	0	1 (33.3)	1 (33.3)	1 (33.3)	0	1 (33.3)	2 (66.6)	0	1 (33.3)	0		
c)	19 (65.5)	0	1 (3.4)	22 (75.8)	6 (20.6)	0	1 (3.4)	3 (10.3)	8 (27.5)	11 (37.9)	7 (24.1)	6 (20.6)	13 (44.8)	10 (34.4)	0		

Table 3.

Confidence and clinical practice for diabetic foot complications: Survey Respondents (N=29)

	Confidence in managing diabetic foot complications				Routinely examine feet of patients with diabetes who don't present with chief complaint of diabetic foot complications				Routinely examine the Non-affected foot in patient with diabetic foot complications			
	Not confident	Somewhat confident	Confident	Very Confident	Always	Mostly	Sometimes	Rarely	Always	Mostly	Sometimes	Rarely
Clinical Position												
Physician n, (%)	7 (36.8)	11 (57.8)	1 (5.2)	0	3 (21.0)	4 (21.0)	6 31.5()	6 (31.5)	6 (31.5)	10 (52.6)	2 (10.5)	1 (5.2)
Physician Assistant n, (%)	2 (28.5)	5 (71.4)	0	0	0	1 (14.2)	3 (42.8)	3 (42.8)	1 (14.2)	2 (28.5)	3 (42.8)	1 (14.2)
Nurse Practitioner n, (%)	1(33.3)	1(33.3)	1(33.3)	0	1(33.3)	1(33.3)	0	1(33.3)	2(66.6)	1(33.3)	0	0
ALL PROVIDERS n, (%)	10(34.4)	17(58.6)	2(6.8)	0	4(13.7)	6(20.6)	9(31.0)	10(34.4)	9(31.0)	13(44.8)	5(17.2)	2(6.8)

Table 4.

Semi-Structured Focus Groups: Total Participants (N=18)

Identified Problems	Common Themes	Quotes
Assessment and diagnostic challenges	Limited physical examinations and lack of support resources	"I think the biggest challenge is when you care for a patient and you to examine for any of these injuries, it's difficult to do this by yourself. Sometimes it helps when you're able to find nurses. But there are a few times when you can't find anyone." "Sometimes it helps when you're able to find nurses. But there are a few times when you can't find anyone." "Sometimes doing a thorough physical exam on admission is a gap. I think if there was a culture to assess patients together with enough support staff- sometimes patients can't move well to show us all their surfaces, and sometimes this warrants support of another individual to help better position the patient to help complete skin exam." "Providers aren't motivated to move patients because we need to get so many people to help us do this, and we have other patients to admit or go see"
	Difficulty assessing and monitoring wounds	"Also when I see patients on the day of admission, I may typically first see them in the ED, and sometimes a full initial exam can be limited -if the patient is in the hallway or tied down on a gurney." "We need to embed in the EMR a place where we can see pictures of the wound." "A lot of times, the wound is dressed, and often time when I see the patients, the wound dressing was just changed. It would be good to have pictures uploaded in the computer that I can view as opposed to putting patient through another dressing change." "This also ties into discharge. We're sending these patients to rehab- Providers and caretakers at a rehab or nursing home should have a picture on discharge they can see and compare to 10 days down the road to say hey 'this is getting better' or 'not getting better'."
	Challenging work up in patients with obesity	"On one of our units there are at least 10 people with BMI of 50 or more. There's only one scale in the hospital for those over 500 lbs- That may affect imaging of wounds."
Management of PIs and DFUs/DFIs	Lack of Knowledge	"If I did find something that was probably a pressure injury that was concerning; my training with wounds is limited or absent on what to do. The physical exam is a great first step, but I need to know what to do with my findings." "One of my biggest struggles is when to involve surgery for debridement."
	Lack of Confidence	"I am not very clinical, and I don't think I would be able to ever get to that level of expertise- Someone like me would rely heavily on wound care team."
	Challenges related to evaluation of patients with obesity	"Difficult to get a reliably accurate weight on patient. So it's difficult to start empiric antibiotics for any infected wound"
Systems challenges	Barriers to implementation of Wound care consultant recommendations	"Difficult to find wound care notes- Let's say I have a patient who's going to the nursing home, I have to sift through all of the progress notes to find the wound care nurse to make sure the patient is on the right treatment that was recommended." "It would be good if you can put in the orders and we can review and co-sign it." "Consider implementing a wound care order set to help." "Another issue is that the admitting nurse inputs information of skin findings in the database of the nursing flow sheet, but providers don't have easy access to this, and it doesn't flow over to the providers' side in the electronic medical record."
	Limited inpatient/outpatient resources	"I think we also need is podiatry."

Identified Problems	Common Themes	Quotes
		“The beds. The beds. Specialty mattresses are not always available” “Another issue is that the nurse/techs don’t have time to turn patients or get them out of bed to the chair.” “One of the issues I’ve had with pressure injuries has typically been anyone presenting after midnight on Thursday is probably not going to be seen by someone who actually knows what they’re doing until Monday” “I’m not familiar with surrounding wound centers and aftercare facilities for patients going to rehab or following up. Who should be following and monitoring these wounds?”
Communication Barriers	Timing of dressing changes Communication with wound care team	“Another issue, that I keep reminding nurses, is to alert us when you are changing a wound so that we can come by. Because after that it is so inconvenient for the patient-because when we come around (maybe after a few hours)-there’s a new dressing in place, and we have to undo it.” “Can’t we have a general wound care pager to contact the wound care nurse on call? Because the person on the consult service varies.”