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Potential of Decision Support in Preventing Pressure Ulcers in Hospitals

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Abstract. The development of hospital-acquired pressure ulcers signals low quality of care. Despite the established guidelines and best practices on pressure ulcer prevention, the incidence of pressure ulcers in hospital remains high. To meet the challenges of consistently translating best practices into effective clinical practices and promote effective teamwork communication and interprofessional collaboration, we consider the failure of consistent care delivery as loss of information and reveal the opportunities of informatics methods to reinforce information delivery, evidenced by typical cases. We, then, explain and summarize information-related issues existing at the initial assessment upon hospital admission, routine treatments, and team communication. Clinical decision support methods are promising in addressing these issues by optimizing care plans, improving adherence to best practices, reinforcing effective team communication, and customizing event report feedback.

Keywords. Pressure ulcer, patient safety, decision support

Introduction

Reducing the incidence of patient safety events is of great importance. A pressure ulcer, which is caused by prolonged exposure to pressure on the same skin area, can cause significant patient harm, including pain, infections, and extended hospital lengths-of-stay [1]. Hospital-acquired pressure ulcers (HAPUs) may signal a result of substandard care [2]. HAPUs in Stage III and IV are designated as "never events", in reference to particularly shocking medical errors that should never occur [3]. In the US, the Centers for Medicare & Medicaid (CMS) provides no reimbursement to hospitals for treatment of a patient who has acquired a Stage III and IV pressure ulcers while under the hospital's care [4].

Pressure ulcer prevention is not a new theme to health care. The knowledge to prevent pressure ulcers is easily accessible through numerous published clinical practice guidelines [5; 6] and best practices in the prevention and management of pressure ulcers. Despite these established guidelines and best practices, the gap exists in translating knowledge into effective clinical practices [7], which prevents care practices being carried out consistently. Evidence suggests that patients may not receive an adequate standard of care to maintain their skin integrity [8]. As a result, incidence and prevalence rates of pressure ulcers remain high. Pressure ulcers resulted in 28,500 documented deaths globally in 2013, more than doubled from 13,700 deaths in 1990 [9].

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The success of the prevention of pressure ulcers heavily relies on teamwork and requires activities among individuals from multiple disciplines, including nurses, physicians, physical therapists, and nutritionists. Interprofessional communication plays a key role in the care practices of pressure ulcers. We consider the failure of consistent care delivery a loss of information. In many cases of care practices, information is scattered and fragmented in terms of two aspects: patients' conditions are not captured in a timely manner at the point of care and nurses' care practices are not well documented and traced. As a result, health providers cannot obtain sufficient information about patient's up-to-date condition; sufficient information about care practices is on demand for the control of the quality of care either. The information delivery among individuals involved in the workflow of HAPUs prevention needs to be reinforced. An ultimate goal would be to deliver the right information (what) to the right person (who) in the right intervention format (how) through the right channel (where) at the right time in the workflow (when) [10]. By investigating and summarizing information-related issues existing in the prevention of pressure ulcers, this work intends to reveal the potential of clinical decision support in bridging the gap in information delivery to reduce HAPUs.

1. Information-related issues in prevention of pressure ulcer

Information flow accompanies the complete health care workflow, in terms of information acquisition (assessments), information delivery (communication), and information processing (application). Failure of any part in the information flow might cause that the information cannot reach the right point when needed. In this section, we summarize a number of typical information-related issues that have been reflected in care practices under the context of pressure ulcer prevention. The workflow of pressure ulcer prevention can be illustrated in Figure 1, on which the main issues related to the workflow as for typical cases are marked.

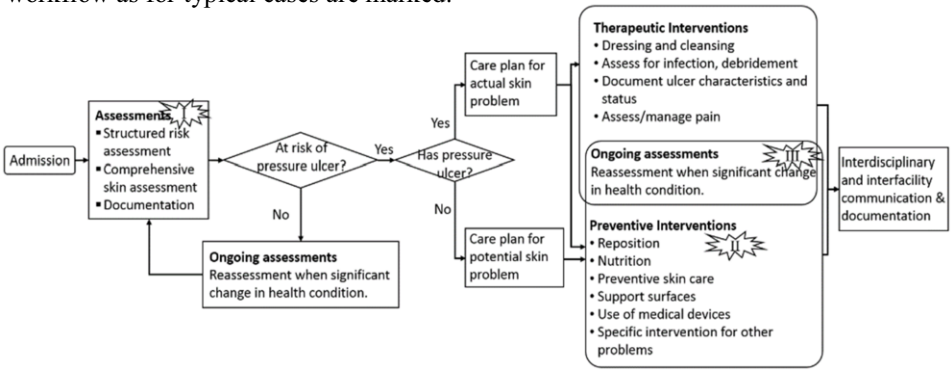

Figure 1. Workflow of pressure ulcer prevention. The chart was developed according to the NPUAP clinical guide [5], the pathway by New Jersey Hospital Association [11], and the ICSI pressure ulcer protocol [12].

1.1. Missing or delayed initial assessments upon hospital admission

Initial assessments, including risk assessment and skin assessment, are the start point to prevent developing pressure ulcers. However, multiple tasks often need to be carried out by care teams. Due to a low priority of pressure ulcer tasks in actual care practices, missing or delayed initial assessments upon hospital admission occur in some cases.

Sometimes an initial assessment is conducted over one week after admission. The resulting loss of information induces that patients cannot be identified in a timely manner. Appropriate interventions and treatments can hardly reach the patient. Therefore, the patient may develop new pressure ulcers or progress existing ones. In the case, for instance, *the case of safety and quality of long-term care* (Case I) posted on PSNet (Patient Safety Network) describes that an old woman readmitted to the nursing facility without assessment after surgery [13]. Obviously, her health condition had changed and her mobility was lower after the surgery. A skin inspection and risk assessment on her readmission to the nursing facility was necessary. If she had received appropriate care, the Stage IV pressure ulcer might be avoidable and she could have survived from the infection.

1.2. Missing reassessments during stay in facility settings

A patient's condition may change during his/her hospital stay. During a surgery, for instance, patients are immobile and positioned on a relatively hard surface. Medical devices, e.g., a tube, may be involved especially in ICU settings. The change of health condition implies the change of risk factors. Best practices recommend undertaking a reassessment in the case of significant change of a patient's condition. A periodical assessment is an efficient way to capture patient's up-to-date information and identify the risk level in time as health condition changes. However, in addition to the low priority of preventing pressure ulcers in nurses' tasks, the burdensome nursing workload makes it difficult to consistently carry out routine work. Thus, missing reassessment causes loss of information about patient's condition. This may lead to nurses' low awareness of preventing pressure ulcers, and newly developed pressure ulcers tend to occur. In a case report, a 35-year-old man with multiple trauma admitted to an ICU during the night shift (Case II) [14]. A skeletal traction weighing 9kg was attached to his foot. During the morning shift, a Stage II pressure ulcer was found on the toe. It was the result of attaching his toe to the bolt of the bed. The skeletal traction treatment confined the patient's leg in a fixed posture, which was a new condition for him. If a reassessment had been performed after the treatment was applied on his leg, the attaching of the patient's toe to the bolt might be noticed.

1.3. Poor performance of routine interventions

The prevention of pressure ulcers highly relies upon nurses' routine work. For example, the key best practice strategy requires repositioning the patient every 2 hours. Such a simple routine work will translate to excessive workload as the quantity of patient grows. There is a distinct difference among patients' requirements since they may have various health conditions. Different routine tasks being carried out by a single person is a common scenario in actual practices. A routine treatment can also be interrupted in actual care practices. In the case *the forgotten turn* (Case III), an old woman had a fall, got right hip and left humerus fractures [15]. The nurse was interrupted multiple times and failed further preventive interventions to the old woman. A Stage II pressure ulcer was found on her left hip in the mid-afternoon. Because of poor performance of routine treatments, patients may develop new pressure ulcers or progress existing ones.

1.4. Lack of effective team communication

The prevention and care of pressure ulcers is a systematic approach and needs cooperation among individuals from multiple disciplines. However, information is frequently lost due to poor team communication. In Case I, the patient was transferred twice between long-term care setting and acute hospital setting. If either facility had well documented the information relating to pressure ulcer and accurately delivered to the other in time, the outcome would be different. In Case II, the patient received medical services during the night shift. A possible reason that caused this incident was the patient's condition was not completely passed to the subsequent nurse and a timely reassessment on the toe was neglected. Lack of effective team communication often causes the loss of information on patients' condition, resulting in incomplete information for decision-making. The consequence might be newly developed pressure ulcers.

2. Potential of clinical decision support

Delivering demanded knowledge to users at appropriate time points would make a difference in improving the outcomes of care practices. With the advantage of informatics, the CDS methods would be promising in addressing these information-related issues by optimizing care plans, improving adherence to best practices, reinforcing effective team communication, and customizing event report feedback.

2.1. Optimizing care plans

The intensive nursing workload is a perceived barrier to prevent pressure ulcers. A nurses usually takes care of a number of patients in actual care practices. The variation among patients' care plans makes it even more difficult to consistently carry out each care plan. Besides, other patients' request may interrupt nurses' routine work. Under this situation, low-priority tasks are likely to be forgotten and the likelihood of missing or delayed assessments, missing reassessments, and substandard routine care can increase. With the advantage of computing ability, an optimized care plan can be automatically developed to guide nurses' actions by integrating information from the EHR system. The benefits of an optimized care plan can be supporting customized care practices for patients and enabling efficient time management for health care providers.

2.2. Improving adherence to best practices

Missing or delayed assessments on admission, missing ongoing assessments, and substandard routine treatment illustrate low adherence to best practices. To address these issues, HAPU prevention must be prioritized, and delivery of care must be maintained. Informatics-based intervention technologies, such as web-based interventions and mHealth interventions, have the ability to alter human behavior in a positive way, for example, sending a reminder when a scheduled action needing to be conducted or generating an alert when missing an essential step is missed. For instance, Tracey Yap etc. implemented cueing innovations with the support of computer technology [16]. Employing these technologies would be helpful to form standardized practice patterns.

2.3. Reinforcing effective team communication

Efficient and accurate information delivery between all participants involved in pressure ulcer prevention is on demand, including the communication within a facility and across facilities. With an effective decision support tool, not only is the information delivered through robust channels but it is also delivered at the right time point. Automatically integrating information from EHR system to support decision-making would be an additional benefit. Usability and efficiency must be considered with high attention when a CDS tool is designed. A new tool would not be accepted under a burdensome working environment if additional efforts were required to use it. As for delivering information across facilities, interfaces for the cross-system communication based on a standardized documentation format should be designed and implemented.

2.4. Customizing event report feedback

An effective way to identify causes to unexpected patient safety events is to investigate them and learn shortcomings from them. In the US, the Patient Safety Organizations have been using the Common Formats (released by the Agency for Healthcare Research and Quality) to report patient safety events, in which an event-specific form is designed for pressure ulcers. Dedicated information about pressure ulcer event is collected at the point of the event reporting. A decision support tool would benefit HAPU prevention in terms of providing feedback to organization managers and educating care providers in a timely manner. To enhance the educational function of Common Formats to benefit reporters, we designed and developed a patient safety event reporting system, in which a knowledge base on pressure ulcer prevention was integrated. The system evaluation showed that it is able to provide customized feedback as to specific event. Testing users showed positive attitudes with an average SUS (System Usability Score[17]) 78.1.

3. Conclusions

The established guidelines and best practices on pressure ulcer prevention cannot ensure the decline of pressure ulcer incidence. The knowledge on pressure ulcer prevention is not consistently translated into effective clinical practices. Since the key role of communication in preventive practices, we consider the failure of consistent care delivery a loss of information. This work has explained and summarized existing information-related issues. The CDS methods are promising in addressing these issues by improving adherence to best practices, reinforcing communication, optimizing care plan, and customizing event report feedback. The CDS methods are not only of significance for the prevention of pressure ulcers, they may also contribute to avoid other patient safety events, such as hospital-acquired infections.

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