Healthcare Opportunities: Experts' Perspectives on Integrating Technology into Prehabilitation

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Abstract

Habilitation services, notably prehabilitation and rehabilitation, are important components of patients' surgical care. Contrary to traditional reactive healthcare models, proactive healthcare in the form of prehabilitation has shown promise in facilitating surgical patients' recoveries beyond rehabilitation alone. This paper examines prehabilitation from the perspective of seven healthcare professionals, and relies on their interviews to better understand prehabilitation and how technology can be integrated into its processes. Specifically, we offer descriptions for why patients

participate in prehabilitation, how clinicians deliver prehabilitation, and how technology could be utilized during these processes.

Author Keywords

Surgical care; prehabilitation; rehabilitation; surgery.

ACM Classification Keywords

• Human-centered computing → Human computer interaction (HCI); Empirical studies in HCI

Introduction

Although rehabilitation is a relatively well-known medical process with widely understood services, prehabilitation is a less familiar topic. Both rehabilitation and prehabilitation are parts of habilitation services, which are defined as "health care services that help a person keep, get back or improve skills and functioning for daily living [1]."

Prehabilitation can be viewed as the first part of the rehabilitation care continuum, which occurs between the time of diagnosis and the start of acute treatment [7]. It can be defined as a health program aimed at improving patients' postoperative recoveries and decreasing morbidities by enhancing functional

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Figure 1: Example of pen and paper exercise tracking logs. Provided by C3.

capacities and tolerances to impending physiological stresses prior to surgeries [5].

Prehabilitation emphasizes patients' healthcare roles (i.e., treatment options and outcomes depend upon patient at-home activities). Studying prehabilitation thus offers a unique glimpse into patient work, which has remained until recently understudied; studies which explore patient work uncover insights regarding how clinical processes and spaces are not designed for patient collaboration [8]. We believe we can uncover similar insights regarding prehabilitation, especially considering that prehabilitation emphasises patient roles, has notably short durations, and requires complex patient-centered treatments [9]. Unfortunately, prehabilitation engagement is often low [4]. Given that outcomes often depend upon program adherence, low engagement is troubling. We hope to use this study to understand clinicians' perspectives regarding prehabilitation in conjunction with future works which incorporate patient perspectives to better understand these issues.

Prehabilitation programs could help many surgical patients if they can be employed scalably and effectively, but this is difficult in practice. Prehabilitation requires a great deal of collaboration between patients and clinicians; programs often require patients to log home-based activities and share logs with clinicians (e.g., physical therapists, dietitians, etc.) so that they can monitor progress and adjust treatments. Currently, patients use paper-based exercise diaries (Fig. 1) to capture and share exercise data with clinicians. This often imposes heavy data collection burdens on patients, and increases clinician data processing workloads. A variety of technologies are currently available for patient at-home self-

monitoring, although they are underutilized in current practices [2]. Research suggests that focusing on both parties in medical processes and understanding how they interact is important for preventing communication breakdowns [6], and we examine prehabilitation with this in mind. This work adds to the growing body of CSCW research aimed at effectively facilitating patient-clinician communication and collaboration, in the less familiar context of prehabilitation.

Method

We conducted 7 semi-structured interviews to understand how and why clinicians suggest patients should participate in prehabilitation, as well as how technology could aid these clinicians. We asked questions specifically to understand the following: who should participate in prehabilitation programs, when, and why; what a typical prehabilitation process is like; how a patient's prior conditions might affect prehabilitation; what kinds of data clinicians want to collect from patients; and what technologies clinicians are currently using for prehabilitation; etc. Each interview lasted from 30 minutes to 90 minutes. Durations varied based on the conversation between the researcher and participant. All interviews were transcribed and coded using thematic analysis [3]. Participants were not compensated for the interview. Please see Table 1 for participants' information.

Why participate in prehabilitation?

All clinician participants believe that most pre-surgical patients could benefit from prehabilitation. Clinicians will delay, or even reject, a patient's surgery if they feel the patient is too weak, frail, or an otherwise poor or marginal candidate for the surgery; such patients are put into prehabilitation so that they may become better surgical candidates. Participants note that

ID	Expertise
C1	Surgical Oncologist
C2	Surgical Oncologist
C3	Surgical Oncology Researcher
C4	Exercise Oncologist
C5	Nurse, Exercise Physiologist
C6	Exercise Oncologist
C7	Surgical Oncologist

Table 1: Participants information

prehabilitation programs, even those which rely solely on exercise, boost patients' strength and confidence, reduce risk for postoperative complications, and speed up postoperative recovery. Clinicians have excluded patients from prehabilitation programs if they have risks associated with pre-existing conditions, general physical condition, or comorbidities, but most clinicians believe that such patients could benefit from custom-tailored prehabilitation. Notably, our participants often expressed that the only patients at risk for prehabilitation exercises are those which would be at risk for complications while exercising in general. That is to say, the only risks of participating in prehabilitation are the same risks as exercising.

What is a typical prehabilitation process?

Prehabilitation is either a unimodal (i.e., 1 component) or multimodal (i.e., multi-component) process for improving patient health prior to surgery; all participants describe physical functioning as the key component for their programs, but one clinician notes also utilizing a nutritional mode to encourage healthier eating. Descriptions of physical functioning modes were not consistent between participants; they varied based upon patient group needs (e.g., walking for older patients, resistance band training for knee replacement patients). Described programs often subdivided the physical functioning mode into sub-modes, like cardiovascular, strength, flexibility, or balance training. Exercises often started out gradually and became progressively more difficult (e.g., walking further or progressing towards higher resistance bands). Clinicians also discuss the importance of rest for the success of the physical functioning program, and they note that the exercises patients performed were those with which patients were comfortable. Prehabilitation programs

incorporated both in-home and at-clinic exercises and check-ups. Patients were required to monitor their at-home activities, in some cases using data from pedometers, and then log their activity, usually with pen and paper (i.e., filling out handouts provided by clinicians). These logs were brought to the clinic typically during the at-clinic activities or at the end of research studies. The logs and activities at-clinic informed clinicians about when and how to alter exercises or progressions. Exercise regimes varied across programs, with different exercise durations (e.g., 5 minutes per set, 20 minutes - 1 hour per exercise session), numbers of at-clinic activities (e.g., 1-3 times per week), number of at-home exercise sessions (e.g., 1-3, and 0 if complications arise) and overall program durations (e.g., 5-8 weeks).

How can technology support prehabilitation?

Technology can be utilized to both support patients and healthcare clinicians during prehabilitation. For example, one clinician participant noted that patients had low compliance in log keeping and suggested incorporating more sensors to lower patient burden and increase data reliability. Our participants have suggested using better sensors for activity and condition monitoring (e.g., pedometers, isokinetic machines, GPS), technologically supporting group activities (e.g., Skype/online exercise groups led by one clinician), easing and quickening data collection and consolidation (e.g., exercise data integration into electronic health records, iPad data logging, momentary analysis questions/surveys/questionnaires) and providing feedback tools (e.g., either positive/supportive or negative for things like smoking cessation, etc.). These suggestions might aid collaboration by promoting medical decision making

Contribution:

Our work explores clinicians' experiences regarding pre-surgical practices with a focus on potentially using technologies in prehabilitation to aid patient-clinician communication. This work further adds to the growing body of CSCW knowledge aiming to effectively facilitate patient-clinician communication in collaborative endeavors in the less familiar context of prehabilitation. We offer the following contributions:

1. A brief description of how and why patients receive prehabilitation, including how patients and clinicians communicate with one another to collaboratively improve patient health.
2. Opportunities for technology to facilitate patients and clinicians in communicating and thus collaborating.

through increased data availability, allowing for more face-to-face time during visits by lessening workloads, and providing opportunities for discussions through recorded data. However, our participants also held the belief that many of these technological opportunities may meet with resistance, as prehabilitation patients tend to be elderly, and so they believe, disinclined to technological options.

Conclusion

Prehabilitation is still a relatively new, and unstandardized program for preventing post-operative complications and improving patients' health and outcomes. Part of that lack of standardization is derived by the varied nature of the patient populations who are enrolled into those programs, as different patient populations will require different exercises, intensities of exercise, and care plans in general. Technology may be able to facilitate healthcare collaboration, for both clinicians in providing prehabilitation and patients in receiving proper care by increasing scalability, reducing burden, and improving accuracy and quality. Further work will be needed to ascertain if our clinicians' views regarding technological disinclination are founded, but we believe that even simple technological opportunities, such as online group activities, could help patients.

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