Published in final edited form as:

Support Care Cancer. 2018 December ; 26(12): 4067–4076. doi:10.1007/s00520-018-4276-0.

Designing for impact: identifying stakeholder-driven interventions to support recovery after major cancer surgery

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Abstract

Purpose: Complex bladder and colorectal cancer surgeries are associated with significant patient morbidity, yet few resources exist to prepare patients for the high levels of distress and complications they may experience. After ethnographic research to identify design challenges, we held a user-centered design (UCD) workshop to begin to develop patient- and caregiver-centered interventions to support preparation for and recovery after complex cancer surgery.

Methods: Concepts that emerged from brainstorming sessions were visually represented on storyboards and rated. Highly scored concepts were further developed in break-out prototyping sessions and then presented to the entire group for review in person and during subsequent webinars. We collected workshop products (worksheets, prototypes, and recordings) for analysis to identify opportunities for intervention. The workshop, held in late 2014, was attended by 3 colorectal/oncologic surgeons, 3 urologic surgeons, 5 ostomy nurses, 1 quality improvement leader, 3 patients, 1 caregiver, and 3 experienced UCD facilitators.

Results: Three opportunity areas were identified: 1) Enhanced patient education including tele-health and multimedia tools (available at hospitals/clinics or online in any setting); 2) Personalized discharge assessment and care planning; and 3) Integrated symptom monitoring and educational interventions. Stakeholders reached consensus that enhanced patient education was the most important direction for subsequent intervention development.

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Conflicts of Interests: Dr. Nielsen serves on the Medical Advisory Board for Grand Rounds, Inc. No other conflicts of interest have been declared.

Conclusions: We engaged diverse stakeholders in a participatory, UCD process and concluded that research and practice improvement should prioritize the development of educational interventions in the pre-operative period to set the groundwork for improving appropriate self-care during recovery from major colorectal and bladder cancer surgeries.

Keywords

Bladder cancer surgery; colorectal cancer surgery; urinary diversion; ostomy; self-care; User Centered Design

Introduction

Surgery is used to manage most common adult solid tumors, yet the physical, psychosocial, and economic burdens of surgery can be substantial. Furthermore, patients, caregivers and providers are often ill-equipped to navigate recovery, in part because resources to support patient and family needs after cancer surgery are lacking.

Patients often face complications after hospital discharge. Thirty-day readmission rates are higher among patients who experience a post-discharge complication (78%) compared to those who do not (12.3%) [1], and while hospital stays after surgery have decreased recently, readmissions have increased, suggesting many patients are not ready to transition to their homes. Major [2] abdominal and pelvic cancer surgeries are associated with complications that directly influence short-term morbidity—some of which may be avoidable. For example, complications occur in more than a third of patients after abdominal and pelvic cancer surgeries, but in many cases do not become apparent until after hospital discharge [3,4]. Such unanticipated adverse events can lead to patient anxiety, urgent calls, unplanned clinic visits, emergency department encounters, and hospital readmissions. This trend may be more pronounced when surgery is performed at a distant referral center [5], in which case patients have to navigate challenging situations with local providers who may have less experience [6].

In addition, patients and families face substantial challenges adjusting to the “new normal” of their postoperative condition. High quality educational and supportive care resources to facilitate patient self-management are a significant unmet need. For colorectal and bladder cancer patients, managing intestinal and/or urinary diversions, or ostomies, and continent urinary or fecal reservoirs is a specific but complex and potentially overwhelming and confusing aspect of self-care [7]. Additional research is needed to identify and propose solutions to patients’ and families’ greatest needs.

Recognizing the potential to improve outcomes, our group has been working with stakeholders to identify opportunities for research and quality improvement. This paper reports on results of a user-centered design process to identify and prioritize interventions for improving recovery at home after major cancer surgery.

Methods

User-Centered Design

User-centered design (UCD) is a participatory approach to intervention development that focuses on the needs and preferences of the people (or “users”) who will ultimately be affected by changes [8–10]. In many healthcare contexts this includes clinicians, staff, patients, and families. As a result, interventions designed according to these principles suit the needs of time-constrained providers and staff, and operate within the workflows of healthcare delivery organizations. UCD is increasingly being used to drive innovation in healthcare and other industries [11,12]. UCD employs “design thinking,” system science, and ethnographic methods [13] to generate creative, implementation-ready solutions to complex problems [14].

UCDs can take many forms [15,16]. Our process followed a six-step cycle: 1) understanding the environment, 2) framing opportunities, 3) imagining possibilities, 4) prototyping, 5) piloting, and 6) spreading innovation [17]. Our goal was to complete the first three steps to generate promising ideas that could be developed and tested in future work (see Figure 1). We adopted the Kaiser Permanente UCD methodology and referred to resources such as the Stanford design school’s workshop modules [14] and our own workshop experience to engage stakeholders in priority-setting [18], as a first step toward identifying opportunities to improve post-operative recovery.

Goal of the Design Workshop

In October 2014, we convened a day-long intervention design workshop with 16 participants: 3 colorectal/oncologic surgeons, 3 urologic surgeons, 5 ostomy nurses, one quality improvement leader, 3 male patients with cystectomy and one wife/caregiver. Three experienced UCD facilitators ran the workshop, including CM who lead it. Our goal was to identify and prioritize opportunities for supporting post-operative recovery after cystectomy and colectomy by enhancing self-care and remote communications between health care providers and patients. While our anticipated focus was on the post-operative recovery period, we structured our design process to allow broader thinking about other intervention points (before surgery or in the hospital) that would have the most impact on postoperative recovery experiences.

Pre-Workshop Activities

Leading up to the workshop, CM, AF, MN, SG and PP (a trained UCD coach) met once a month to discuss recruitment, data collection and analysis, workshop goals, and logistics. Participants were identified opportunistically, using purposeful sampling [19–21] to assure representation of key stakeholders (surgeons, nurses, patients and family members, and quality improvement leaders). We invited participants directly or by referral using contacts of the planning group, which spanned academic surgery and Kaiser Permanente clinical and quality improvement networks. Patients and caregivers were identified by ostomy nurses and surgeons in nearby health systems. We employed ethnographic methods to understand the environment of post-operative care. We reviewed data previously collected by experienced qualitative researchers in two studies. One was an ethnographic study involving in-depth, in-

home interviews and participant-observation with 31 colorectal cancer survivors with ostomies and their informal caregivers [22,23]. The second was formative research for a survey. The formative research included 3, in-person, 90-minute long focus groups and several 30–60 minute long telephone interviews about preparation for and recovery from cystectomy. Participants included 32 bladder cancer survivors who were Kaiser Permanente Northern California members with a history of cystectomy. We also collected new data for this project, under the supervision of the first author (CM), in order to learn more from clinicians' perspectives and to add data from an academic referral setting (Moffitt Cancer Center and University of North Carolina) to the previously collected community setting data. MN and SG conducted in-person, focused qualitative interviews about challenges and care improvement opportunities after colectomy and cystectomy from 13 clinician colleagues (surgeons, nurse practitioners, physician assistants, and ostomy nurses). They created detailed notes from the interviews, which were sent to CM and AF for analysis.

Analysis for design purposes relies on sharing and categorizing insights from data collection to form the basis for framing design solutions. Toward this goal, we used an inductive, modified grounded theory approach for analysis that used constant comparison and pile sorting to identify basic processes and categories in the experience of patients and clinicians [24]. CM and AF reviewed all the text from secondary and primary data collection and created lists of ideas relating to communication needs relating to post-operative recovery.. CM and AF met several times to combine and categorize their lists. These results were discussed with MN, SG and PM, to result in three insights. Our first insight was that information exchanges to support post-operative recovery span three settings: home, hospital and clinic. Second, we were designing for two types of users: 1) patients and informal caregivers; and 2) health care providers. Third, we needed to design solutions that responded to what different users told us about both *how* they wish they could communicate and *what* they wish they could communicate about (see Table 1).

Another data synthesis approach relied on case studies. Several stories from participants in the caregiving ethnography and cystectomy focus groups that highlighted key challenges of home recovery were selected to help guide our design process and build empathy for patients' experiences. These included the story of a woman, readmitted once after cystectomy when a follow-up visit to an ostomy nurse discovered a serious complication, who returned home from the hospital a second time without good ostomy self-care skills or sufficient supplies. She was unable to take care of her ostomy appliance, and a period of emotional and physical exhaustion led to a second readmission for supportive care. A second story involved a daughter caregiver who realized that her mother had not gotten out of bed or resumed eating a week after her colectomy due to depression associated with having a colostomy.

These insights and stories helped us to articulate a clear perspective about the ideal conditions for enhancing postoperative recovery (see Figure 2) as well as the ways in which communication systems could help to achieve those ideal conditions. Additionally, we identified "use requirements" for a mobile or web-based health information exchange toolkit:

1. It can be used in many health systems
2. It conveys information between patients and clinicians without direct communication
3. It also facilitates direct communication when needed
4. It assesses symptoms empirically (i.e. sensors, photos) and through self-report (i.e. survey-style questions, checklists)
5. It complements, rather than duplicates, telemedicine capabilities and other communication modalities
6. It is user-friendly, engaging, and efficient

Next, we created specific design challenges, asking what practices or systems could do to achieve those goals (see Table 2). These questions, sometimes referred to as “How Might We” statements, aimed to spur brainstorming.

Workshop Activities

We structured the workshop to include an initial presentation of our first phase of design: patient stories, background information, and insights from pre-workshop data collection and analysis. Participants started recording their own insights and ideas on white boards, worksheets, and post-it notes. Next, we presented the “How Might We” design challenges. Participants selected a design challenge to work on and engaged in brainstorming sessions. Their ideas were then presented and prioritized by a round of voting; participants were handed 7 stickers to use however they wished to indicate support for each idea. After some group discussion, we engaged in an early prototyping session to develop the most highly ranked ideas generated by the brainstorming sessions. These prototypes were then presented and another, similar round of voting followed.

Data Analysis

Authors CM, SG, MN, and AF met several times between November 2014 and February 2015 to review and synthesize materials from the workshop, including written and typed notes, photos, and videos documenting what was written on whiteboards, developed in prototyping exercises, and mentioned during discussions. Through a consensus process, we combined a few intervention ideas that were very similar, identified key messages, and clarified the three opportunity areas described below. The synthesis was shared broadly with participants in a webinar and via email. Workshop participants were invited to collaborate further. Those who expressed interest were involved in the writing of this report.

Results

All of the ideas centered on enhancing self-care. These ideas represent three distinct opportunity areas, each of which received strong endorsement by attendees. Participants also found value in the workshop as highlighted in their written plans for action at the end of the day (Table 3) and comments during a wrap-up discussion (Figure 3).

The opportunity areas identified were:

1. Enhanced patient education including tele-health and multi-media tools (available at hospitals/clinics or online in any setting)
2. Personalized discharge assessment and care planning
3. Integrated symptom monitoring and educational interventions

1. Enhanced patient education:

In the first round of brainstorming, ideas included an *enhanced pre-operative in-person visit*, aimed at preparing patients for surgery. This visit could be combined with other pre-operative visits with the surgeon or an ostomy nurse. It would involve a tour of the hospital, glucose screening, meetings with the care team or home health agency representatives, review of home environment to identify risks and resources related to post-operative recovery, clarifying expectations about surgery, education about optimizing nutrition before surgery, and opportunities to try out and take home supplies such as ostomy supplies or a spirometer (used to encourage deep breathing as an aid to recovery). Participants also suggested a *frequently answered questions (FAQ) resource* available online and in paper format that would provide expert resources for patients to help prevent complications and promote independence during recovery. Patients and caregivers whose interviews were included in our ethnographic data analysis as well as those at the workshop reported that local primary care providers, home health agency nurses, and emergency room providers often have limited knowledge of the unique considerations relevant to patients in this context. This increases the need for educational interventions that empower patients and caregivers to be as informed as possible as they engage with the health system beyond their specialized cancer care team.

Participants also brainstormed a *pre-operative video visit with an ostomy nurse (WOCN)* to provide consistent, comprehensive pre-operative education and information to patients. Clinical stakeholders imagined that video visits with an ostomy nurse could be offered when patients are unable to attend a pre-operative counseling appointment in person or when travel placed a significant burden on patients and families. Resources mailed in advance of the televisit could facilitate education and encourage patients and families to think of questions for their care team. Ostomy nurses extended this idea to include possibilities for video visits to patients in nursing homes or assisted living facilities as well as for follow-up care. They noted that benefits of video visits included the ability to view and then provide education specific to the home environment, the ostomy and appliance, as well as self-care practices. Nurses reflected that this opportunity could be implemented quickly, as video visits were becoming part of standard care at KP.

Another idea was to provide *multi-media education and training modules in the hospital*, with the aim of empowering patients to learn self-care skills and reinforce in-hospital teaching by nurses and surgeons. The modules could be available via hospital TV, at bedside, or on a tablet. Providers could track progress and customize or prescribe specific content.

The first voting round yielded 14 votes for the pre-op ostomy video visit and 14 votes for the enhanced pre-op in-person visit. The inpatient education idea was not highly endorsed (6 votes) and thus was not part of the second design phase (prototyping). Because the video visit and pre-op in-person visit ideas were similar, we combined them for prototype development. The result was a prototype for a *surgery preparation course and post-op “survival kit.”* It would include materials that could be handed out as part of a day-long pre-operative orientation class or provided in conjunction with a video visit or online course. This would provide patients with essential information about their surgery as well as a variety of tools to prepare for recovery at home. The kit could include nutritional supplements patients could taste test before surgery, supplies for ostomy, catheter, or irrigation care, handouts and care-team contact information, and a wearable activity monitor to encourage physical activity. This survival kit was envisioned as a resource to promote active engagement in preparing (physically, emotionally, and logistically) for the surgery and recovery. This prototype received the highest endorsement (22 points).

Personalized discharge and care planning:

Another set of ideas included approaches to personalized discharge planning. One group developed an idea of enhanced, *personalized take-home packets*, which could be accessed online or printed as handouts. These would provide information to reinforce self-care education patients received in the hospital, and would also provide links to other post-operative resources, such as lists of symptoms of complications or problems that should be reported to the care team. This idea received 13 votes in our first round of voting and was developed into a prototype for an *integrated, smart discharge navigation system* that would utilize risk assessments and analytics to create tailored education and care plans, with suggestions for risk-stratified follow-up outreach and interventions. Workshop attendees envisioned a multi-platform system that would include a portal to collect data from patients (and caregivers) in the hospital, and that would also draw from data in the electronic health record. A patient navigator would ideally connect patients to resources based on an initial risk assessment in the hospital, and would follow-up 48 hours after discharge to reassess patient needs. This prototype received 15 points.

Integrated symptom monitoring and educational interventions:

Participants imagined a *mobile symptom monitoring system or “app”* that would capture patient data to facilitate early detection of complications. The system would include wearable monitors as well as a way to collect patient-reported symptoms. Patients and caregivers would begin using this system in the hospital and be comfortable using it before discharge. A similar idea was developed for a *tablet-based one-stop-shop* that would come pre-loaded with apps for modules such as pre-operative and postoperative education, patient stories, and patient symptom tracking journals. The tablet could be loaned out to patients between their pre-operative visit and a post-operative follow-up visit (approximately 3 months). Another idea was to provide direct access to specialty nurses who could provide expert advice to patients calling the care team, in accordance with a triage protocol and standing orders. Ideally these nurses would also have access to patient-reported symptom data or biometric data from wearable monitors.

The symptom monitoring ideas received the highest number of votes during round one (25); these ideas were combined into one prototype. The result was a *Gastrointestinal (GI)/Genitourinary (GU) diversion binder* to provide a “one-stop” comprehensive multi-media discharge resource. It could be a physical binder with links to resources as well as a website dedicated to GI/GU diversion patients. It would provide physiologic monitoring connectivity, training modules and instructional videos, and methods for directly accessing expert advice (as opposed to calling a general advice line). Specific content could cover topics identified during our ethnographic analyses, such as assessing and anticipating patients’ self-care capacity, how to take care of and monitor skin at the ostomy and incision sites, anticipated ostomy wear time, catheterization, monitoring for significant complications after surgery, preventing and staying alert to dehydration, the benefits of resuming activity, as well as monitoring pain, cognitive status, and emotional well-being after surgery. This discharge resource binder could be used at home and a web-based version could be accessed through a patient web portal. This prototype received 17 points.

Plans for action

We asked each attendee to list next steps they were hoping to accomplish after the workshop. Questions included: “What can you do tomorrow?”, “What will you share with your peers or your team?”, and “How would you like to collaborate with this group as we move forward?” Although the workshop was convened to generate ideas for future research, participants also identified personal goals that derived from the activities (Table 3).

Discussion

The UCD workshop resulted in an outcome that its conveners (CM, SG, MN) did not expect. While the workshop aimed to develop interventions for remote monitoring and improved communication for the post-operative period, we quickly learned that these efforts would not be productive in the absence of strong, pre-operative education. Subsequently, we have begun pursuing a more patient-centered target: developing an online educational platform to provide high-quality information about major cancer surgeries, starting with cystectomy and then expanding to cover other surgeries. We highlight several “lessons learned” from our process.

Lesson 1: Do as much ethnography as possible during the early phases of design:

We present details of a UCD process that included substantive ethnography involving primary and secondary data collection during the “inspiration” phase. The ethnographic work helped to frame our “ideation” phase broadly, encompassing elements of the surgery experience beyond recovery at home. By doing so, we opened the door to a wide range of design ideas during our workshop; our research priorities shifted considerably as a result.

Lesson 2: Involve patients as partners and design solutions through reference to specific stories:

Despite active recruitment efforts we were only able to find 3 patients and a caregiver who were interested and able to participate. We aimed to amplify the patient/caregiver voice by

starting off the day with first-person accounts by these participants, which emotionally connected researchers and workshop participants to the problems patients face post-operatively. Using other, previously collected stories from patients and caregivers was useful for highlighting priorities from the patient point of view. Others have commented on the power of stories and patient participation in design to foster empathetic design [25–27] solutions; in our experience, stories also energize and motivate participants to be creative.

Lesson 3: Involve a variety of clinical stakeholders:

We focused on monitoring in planning the workshop, but a strong consensus emerged that effective post-operative communication and successful recovery needs to be set up with enhanced education and communication pathways before surgery. Our planning team included only the clinical perspective of surgeons. The nurses who attended the workshop questioned the focus on post-operative monitoring. Without their involvement, our research plans would probably not have changed as dramatically.

This report describes our efforts to follow a design process that has been widely adopted in many industries including health care [28]. Our example contributes to a growing literature describing health researchers' efforts to incorporate and reflect on the UCD process for intervention development [29,15,30–36]. We did not move quickly into the prototyping stage, but rather worked for more than six months on the on initial steps of the design process. In contrast, we found that published reports of UCD in health research sometimes minimize the steps of “framing opportunities” and “imagining possibilities” (Figure 1) by going directly from ethnographic discovery to prototyping [37], or going directly to feedback on prototypes without deeply engaging users in the earlier phases of the design process [38,39]. We found benefit in exploring early phases of design before moving forward with specific projects. Doing so maximized opportunities for identifying interventions that have a high priority for stakeholders, as evidenced by the change in our focus from monitoring to education. The downside of our approach was that it was resource intensive, time consuming, and resulted in intervention directions that required new areas of expertise in our research team (health education and educational website design).

On a final note, while our work prioritizes psychoeducational interventions to support recovery from major cancer surgery, remote monitoring after surgery remains a promising area of research [15] and was also identified as an important opportunity. Remote monitoring technologies have emerged as a potential innovation to address unmet needs of patients and providers surrounding care transitions. Remote telemonitoring and structured telephone response after recent hospital discharge after heart failure has been associated with reduced all-cause mortality, costs, rehospitalizations, and improved quality of life [40]. In the cancer care setting, automated, interactive voice response (IVR) technology has shown some efficacy in reducing pain and symptom severity for breast cancer patients [41], as well as symptom severity after cancer-related thoracotomy [42]. Other mobile technologies to monitor symptoms have also been evaluated [43]. A surgical oncology intervention developed using the same engagement and design approach that we used, but for lung resection patients, identified symptom monitoring as but one of several functions that

clinicians and patients would like to include in a tele-health intervention to support surgical recovery [15].

Technology interventions show promise for improving outcomes for cancer patients [44,43,45,46,15]. A recent review concluded that their utility is driven by: 1) limiting disruption and offering ease of use; 2) delivering personalized care remotely; and 3) providing a reassuring “safety net” where patients feel a provider is keeping an eye on them [47]. These findings underscore the importance of stakeholder engagement and ethnographic research in building interventions.

Conclusion

Through a UCD process, stakeholders pointed to lack of education and preparation for post-operative recovery as a major opportunity for improving the management of bladder and colorectal cancer patients. Health education and communication systems to support post-operative recovery are not well developed, and such systems are needed. Patients currently undergo major surgeries without a full understanding of their recovery course and often do not have resources for self-management [7]. Our process generated several ideas that should be confirmed in other settings and which could be developed to address these substantial needs.

Acknowledgements:

We are grateful to the Garfield Innovation Center for providing coaching and a wonderful facility for creative thinking. We also thank the patients and caregivers who attended our workshop for their insights and guidance.

Source of Funding: This work was supported by the Kaiser Permanente Garfield Innovation Center, San Leandro, CA and NCI (Bethesda, MD) R01 CA164128 (McMullen, PI).

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Figure 1. User-centered design process and methods used in this case, adapted with permission from the KP Innovation Consultancy

Figure 2:
Ideal Conditions for Successful Post-Operative Recovery

Cool to see the innovation process	We can be very creative, problem solving	Not all our solutions need to be high tech	Cool to see what the future holds	Heard providers' viewpoint
Good to voice my concerns	Nurses, MDs & patients coming together to work on common goal	I hate tech & I have to say I'm excited	Issues clearly identified	Collaborative, energizing
Addressed all the "why's" I had	Honored to be a part of this	Finally a group of people interested in ostomies	Our designs came together	Universal themes
I can't believe we don't have solutions in 2014	Good that there's a group finally together to tackle this	Good to stop & think creatively	Inspiration that care can be smooth and standardized	Thinking creatively about innovation boils down to system/process changes
Improving the care experience	Implementable ideas	Common issues across geo-graphic regions & health systems	Appreciate how active everyone is in moving things forward	

Figure 3:
Take-Away Messages from Workshop Participants

Table 1:

Communication needs of healthcare providers, patients and caregivers

	Patients and Caregivers	Healthcare Providers
How they wish they could communicate	<ul style="list-style-type: none"> • YouTube • Video/Visual Instructions • Home visits, especially by Wound Ostomy Care Nurse • Communicate efficiently with the right type of provider rather than getting bounced around 	<ul style="list-style-type: none"> • Dashboards • Triggers/thresholds serve to triage communication • EMR integration • Complete but concise information • Tele-visits • IVR/Automated phone calls
What they wish they could communicate	<ul style="list-style-type: none"> • Self-care (ostomy, catheter, irrigation, drainage tubes) • Diet/appetite • Bowel management • Wound healing • How to sleep better • What is normal • How to get help 	<ul style="list-style-type: none"> • Patient's self-care capacity • Skin at ostomy/incision site • Ostomy appliance wear time • Catheterization frequency • Failure to thrive • Fever and vitals • Early detection of sepsis, urinary tract infections • Dehydration (fluid intake/output, urine color) • Activity level • Confusion/cognitive status • Emotional well being • Pain • What is normal

Table 2:

“How Might We” statements prompt participants to brainstorm and prototype ways to reach an ideal state

Setting	Design Challenges
In the hospital, how might we...	...send patients home knowing what to expect, and prepared to care for themselves, independently or with the help of others? ...put patients on the right course for successful recovery by anticipating and monitoring their needs once they get home?
At home, how might we...	...help patients to easily track and report the symptoms that matter to them and their health care team, and assure patients that if something is wrong, the health care team will be made aware and reach out to them? ...extend patient education into the home so that patients experience clarity and confidence about what to expect and what they need to do?
In the clinic, how might we...	...provide complete and concise information that helps nurses to triage and respond effectively to patient concerns? ...nimble modify discharge and follow-up care plans to bolster support for patients who need more attention?

Table 3:**Results of Brainstorming and Prototyping**

Opportunity Area	Highest-Rated Prototype Intervention	Description
Enhanced patient education including tele-health and multi-media tools (available at hospitals/clinics or online in any setting).	Surgery preparation course and post-op “survival kit.” (22 votes)	<ul style="list-style-type: none"> Resources promote active engagement in preparation and recovery. Provides patients with essential information about their surgery and a variety of tools they could use to prepare for recovery at home. Delivered through a pre-operative class or in conjunction with a video visit or online course. The kit could include samples of nutritional supplements that patients could taste test before surgery, supplies for ostomy, catheter, or irrigation care, handouts and care-team contact information, and a wearable activity monitor to encourage pre-operative and post-operative physical activity.
Integrated symptom monitoring and educational interventions.	Gastrointestinal/Genitourinary (GI/GU) diversion binder (17 points)	<ul style="list-style-type: none"> “One-stop” comprehensive multi-media resource. Either a physical binder with links to resources or an online site dedicated to GI/GU diversion patients. Provides physiologic monitoring connectivity, training modules and instructional videos, and methods for directly accessing expert advice (as opposed to calling general advice line for all health system patients). Content could cover many of the communication needs identified during pre-workshop ethnographic analyses. Could be used at home and could be accessed through a health system patient portal. User-friendly for individuals who are not computer savvy. Feasible with existing resources, but would require dedicated staffing and funds for development and maintenance.
Personalized discharge assessment & care planning.	Integrated, smart discharge navigation system (15 points)	<ul style="list-style-type: none"> Risk assessments and analytics create tailored education and care plans, with suggestions for risk-stratified follow-up outreach and interventions. Multi-platform system that would include a portal to collect data from patients (and caregivers) in the hospital, and that would also draw from data in the electronic health record. Personalized take-home packets, accessed online or printed as handouts, reinforce self-care education learned in the hospital, and also provide links to other post-operative resources, such as symptoms of complications or problems that should be reported to the care team. A patient navigator connects patients to resources based on an initial risk assessment in the hospital, and would follow up with all patients 48 hours after discharge to reassess patient needs.