DESIGNING COMMUNICATION AND COLLABORATION FOR QUALITY IMPROVEMENT IN PATIENT-CENTERED CARE TRANSITIONS

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Elizabeth Vander Veen, MDes '17

21ST CENTURY HEALTHCARE

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Contents

Abstract

Keywords

Acknowledgments

Abstract

This project demonstrates the application of an integrative design approach through an embedded designer presence in a new Collaborative Quality Initiative (CQI), the Integrated Michigan Patient-Centered Alliance on Care Transitions (I-MPACT). The I-MPACT organization recruits and formalizes patient-inclusive cross-disciplinary and cross-institutional teams from across the state of Michigan to work in improving the quality of care as patients transition between hospitals, healthcare organizations, and home. Before determining local interventions, clusters of hospital and physician organization form site-based I-MPACT teams that first come together in all-day design-led I-MPACT Kick-off Workshops. This thesis documents the role of design and designers in both the initial development of these collaborative workshops and the iterations that allow for the I-MPACT team to independently conduct future workshops following the completion of direct design involvement. The thesis highlights the design of *Take Care*, a collaborative, role-based card game simulating the complexities of discharge. By engaging new cross-disciplinary teams in an energizing, thoughtful, and sometimes frustrating new experience, the design of this game builds joint understanding necessary for shared intentional work.

Keywords

Design

Care Transitions

Quality Improvement

Healthcare

Game Design

Integrative Design

Patient-centered

Collaboration

Cross-disciplinary

"We always live at the time we live and not at some other time, and only by extracting at each present time the full meaning of each present experience are we prepared for doing the same thing in the future. This is the only preparation which in the long run amounts to anything."

John Dewey

Experience and Education, 29-30

Acknowledgments

I started this work with deep gratitude, and I finish with the same. Nothing was done alone.

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our professor who does not profess, our director who does not direct, our mentor, advocate, guide, and glue. Thank you. Any expression of gratitude for your support, vision, and courage in creating this something out of nothing would be an understatement. A few 'thank you's are not enough to repay your persistent generosity of time (and unending bowls of candy). But I owe you a particular note of thanks. I am ever grateful to you for welcoming me into your first design cohort, for taking a risk on a speech-language pathologist who had the odd gumption to want to come and help make something out of integrative design.

Now we all have made the first of something.

My last piece of gratitude goes to those who will make
something next.

With many thanks to each and all,

Elizabeth Vander Veen
April 2017

As a patient, healthcare comes in a jumble of people and places: doctors, waiting rooms, caregivers, systems, kitchen tables, diagnostics, nurse technicians, ambulance rides, therapies, medicine cabinets, hospital beds.

It's in the movement from one to the other when things get lost. It's in memorizing the details while forgetting the whole, the whole of the history or the whole goal, when one provider hands off to the next one on shift. It's when things get overlooked. It's in the murmur overheard outside in the hallway. It's in the answers that aren't understood to questions that aren't quite asked before finally getting a ride home. It's often in the moment to breathe, after getting there at last, that the questions arrive, all of the ones that couldn't come to mind when the nurse handed out that last little cup of pills. It's in the measured, unsure dressing of a wound that needs a fresh one. Then it's in the minute when something happens, and things might be okay or they might not. It's in the papers somewhere, that number to call, the one if things got worse. And it's in the decision that needs to be made, the decision to stay here or the decision to go back to the hospital and the white coats and the emergency room.

It's in the transitions of care where human details are often brushed past too quickly, pushed to the side in the rush.

INTRODUCTION & CONTEXT

Improving quality in healthcare requires improving care beyond the walls of an operating room, a hospital floor, or a physician's clinic. Improving care also means working to create better transitions for patients as they move between receiving care at hospitals, clinics, skilled nursing facilities, and home. Gaps in these care transitions create costs, both financial and human (Coleman 2003). Readmissions to the hospital can be one symptom of problems in care transitions. A 2004 estimate places readmission costs at 17.4 billion dollars annually for Medicare and Medicaid (Jencks 2009). Breakdowns in care transitions carry a human cost as well. It is one thing to have had a well-trained team of professionals provide high-quality care for a patient in a healthcare setting, and it is another for a patient to arrive at home, equipped with neither the environment nor the education to know quite what to do to manage a wound or use a feeding tube. Addressing the complexity of care transitions between disparate and diverse entities calls for all of their participation.

In order to cultivate the collaboration required for people to come together and address the large, difficult problem of care transitions, integrative designers were invited to work alongside healthcare partners in the early stages of a new long-term quality improvement initiative. This thesis highlights and documents one component of this work: the design of a collaborative, role-based card game for engaging newly formed healthcare teams in the underlying assumptions and inherent difficulties of addressing problems in the quality of care as patients transition from hospitals to home. Based on insights developed from observations and interviews, the *Take Care* game simulates hospital discharge and provides experiential learning while building team rapport and communication.

Healthcare Context

Healthcare exists in an uncertain ecosystem. The overall social and political environment in the United States around healthcare in the 21st century is in a continual state of change arising from its sheer size and complexity. In 2015, healthcare spending as a portion of the US economy made up 17.8 percent of Gross Domestic Product, up from 17.4 percent in 2014, with the Affordable Care Act cited as a factor in the increase as reported on the National Health Expenditures 2015 Highlights website from the Centers for Medicare and Medicaid (CMS). The hope is that future change is accompanied by future improvement, and that we continue to develop our own healthcare systems to support our own health.

The gap between the current state and ideal state of quality healthcare in the United States was described as a “chasm” in a 2001 Institute of Medicine report on a vision for “a new health system for the 21st century.” Reflecting on the report ten years later, the uncertainty, difficulty, and errors have increased, with a deepening sense that there are no easy answers and no end point, only a journey (Dentzer 2011). The tools and strategies for quality improvement in healthcare have varied over the years and across levels of implementation on the local, state, and national levels. Metrics and accountability to motivate performance are common, with assessment techniques carried over from those of medical research, emphasizing control of variables, scale in order to demonstrate significance in a flood of complexity, and a bias for practice that is substantiated by randomized control trials.

Six aims of the original 2001 report continue to be used as drivers for healthcare quality improvement: safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity. The most game changing of these aims is that of patient-centeredness (Berwick 2009). Indeed, the highest stage of organizational change described in the IOM report was defined by the extent of the patient’s role (2001, 115). The difficulty in reaching such a stage was acknowledged, and organizations were encouraged to, “draw on the experiences of other sectors and adapt tools to the unique characteristics of the healthcare field,” (IOM 2001, 116). The fields of manufacturing quality improvement and engineering, particularly for complex adaptive systems, were directly encouraged as sources for improvement methods (IOM 2001). Now, more than 15 years later, another generation of methods can be applied to healthcare improvement and further developed: those from design.

Second-Generation Methods

Similar to the healthcare industries appropriation of engineering techniques, the development of design methods also first adapted procedures and processes from engineering (Rittel 1984; Jones 1977; Archer 1979). When the step-wise, engineering style processes were not up to the task of the problems designers were addressing, these first methods were overwritten with second-generation design methods (Rittel 1984). The issues these first generation tools solved were tame problems. Indeed, “Many methodological problems in design seem to stem from the membership of design problems in the class of “wicked problems,” (Rittel 1995, 2138). Complex, messy societal problems require a different approach.

Wicked Problems

As opposed to tame problems, which can be readily posed and methodically solved, wicked problems are never fully comprehensible and not truly solvable. These problems are “wicked” in that they have a sense of being, “malignant (in contrast to ‘benign’) or vicious (like a circle) or ‘tricky’ (like a leprechaun) or ‘aggressive’ (like a lion, in contrast to the docility of a lamb),” (Rittel and Webber, 1973). Characteristics of these problems, such as those encountered with large-scale planning efforts, are provided in the accompanying table. Because the judgments and decisions in defining the problem are so integral to addressing the problem, participation from many perspectives is required throughout the working process.

Table 1

Characteristics of Wicked Problems

“Wicked problems have no definitive formulation, but are formulated and reformulated all the time.”
“Everything that is said about the nature of the problem is also a statement about the solution of the problem.”
“Wicked problems have no stopping rule.”
“There is no criterion for correctness. The resolution of a wicked problem is not true-or-false, but good-or-bad, with differing opinions.”
“Every wicked problem can be considered to be a symptom of another problem.”
“The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem’s resolution.”
“There is no complete, exhaustive, well-defined set of permissible operations in a wicked problem.”
“There is no immediate and no ultimate test of a solution to a wicked problem.”
“Wicked problems either have many solutions, or none. They have no unique solution, with neither a numerable nor a complete set of solutions.”
“Placing a wicked problem on too low a level may make things worse. (Suboptimization).”
“Every wicked problem is essentially unique.”
“Every solution to a wicked problem is a ‘one-shot operation’; because there is no opportunity to learn by trial-and-error, every attempt counts significantly.”

Sources: Compiled and adapted from three sources: Rittel and Webber 1973; Rittel 1995, 2623-27; Rittel 1997, 2138-40.

Care Transitions in Healthcare as a Wicked Problem

Care transitions are, “a set of actions designed to ensure the coordination and continuity of healthcare as patients transfer between different locations or different levels of care within the same location,” (Coleman and Boult 2003). Transitions require the involvement of hospitals, organizations, clinics, providers, personnel, caregivers, communities, business, agencies, regulators, delivery systems, medical groups, and patients, many of whom often have chronic and complex health conditions. Patients with heart failure, for example, have been described by Albert et al. as dealing with “the fragmentation of patient care” and all the stress, increased costs, and decreased quality involved with breakdowns in communication, education, continuity of care, medication reconciliation, and access (2015).

To focus on quality improvement in care transitions is to focus on the very messy complexities of healthcare itself. It has the telltale signs of a wicked problem. There is no end point (Dentzer, 2011). Knowing a solution at the start and implementing evidence-based solutions that have already been researched is not enough (Albert et al. 2015). Perspectives are limited as providers are typically focused on a single location, making collaboration critical albeit difficult (Coleman and Berenson 2004). An ultimate test of a solution does not exist, and the choice of outcomes for measuring transition of care programs, “will vary by stakeholders,” (Albert et al. 2015). The problem, and therefore the solution, depends on whose perspective is taken. High variation in systems, people, and service makes it difficult to recommend implementing specific interventions in the face of low evidence (Kansagara et al. 2016). Scientific evidence deals in generalizations (Nilsen 2015), but each transition has its own particularities. Improving transitional care is a wicked problem. Therefore, to combine the need for specificity and general approaches, these problems will need to be approached with cross-disciplinary specialists and larger-scale collaborative structures for improvement.

The Integrated Michigan Patient-centered Alliance in Care Transitions (I-MPACT)

The Integrated Michigan Patient-centered Alliance in Care Transitions (I-MPACT) is a program that provides structural elements for quality improvement to occur in the complex environment of care transitions. In this section I will describe the I-MPACT initiative and how it could be viewed in terms of supporting collaborative work on wicked problems. First, I contextualize the notion of patient-centeredness, an idea central to I-MPACT and embedded into its name. Second, I offer definitions and context for collaborative quality initiatives (CQIs) within the broad, overarching goals and practices in healthcare quality improvement. Then, I document how the new I-MPACT project is shown to push the innovation of these collaborative quality initiatives even further. I suggest that this leaves two main needs, or implicit requirements, that are inadequately addressed with their current quality improvement practices: (1) the need for new methods to accelerate cross-institutional collaboration for action, and (2) the need for including the patient in the process. Finally, I relate the initial invitation from I-MPACT leadership for integrative designers to join the project and give an overview of how design involvement brought design practices to address these two main needs.

PATIENT-CENTEREDNESS

Although not a new concept, patient-centeredness was brought to the forefront and "enshrined" in the 2001 Institutes of Medicine healthcare quality report. It includes varying definitions and with widening scope. Within the report several descriptive criteria are given. For example, it "encompasses qualities of compassion, empathy, and responsiveness to the needs, values, and expressed preferences of the individual patient," (IOM 2001, 48). Or the committee provides more specific goals, such as, "to customize care to the specific needs and circumstances of each individual, that is, to modify the care to respond to the person, not the person to the care," (IOM 2001, 51). When later describing the work behind the IOM report, having been a member of the committee, Berwick called attention to the committee's shift away from an initial 1998 framing of healthcare quality in three factors: overuse, underuse, and misuse. Instead, aims were expanded to six[1], and patient-centeredness was included, allowing the possibility for a comprehensive reframing of the patient role in healthcare. It is a concept that, if taken seriously and transparently, can radically change healthcare (Berwick 2009).

Patient-centeredness, as defined by Berwick, is:

> The experience (to the extent the informed, individual patient desires it) of transparency, individualization, recognition, respect, dignity, and choice in all matters, without exception, related to one's person, circumstances, and relationships in health care, (Berwick 2009).

This view of patient-centeredness is not universal. A tension exists between the need for expertise and professionalism and the need for patient agency. Berwick described two initial camps of "classic professionalism" and "radical consumerism," (2009). In the years since, some arguments emphasize the importance of safety decisions that

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[1] *As mentioned above, these six aims are safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity.*

at times supersedes the patient's decision-making (Buetow, 2013). The suggested response is to approach the relationships between the care-team and patient with more equality rather than patient priority (Buetow 2013; Buetow and Elwyn 2008). On the other end is the self-titled "extremist" view of having the patient central and of holding utmost priority as a person, even when still the recipient of care. The patient role remains in flux, and the shift to patient-centeredness is one without easy answers. Even so, the urgent needs and high value of healthcare have spurred work in the area of quality improvement and cost reduction with patients' concerns at the center.

COLLABORATIVE QUALITY INITIATIVES

I-MPACT is a collaborative quality initiative, or CQI. These initiatives organize participation from multiple institutions and concentrate efforts to improve best practices in focused areas, which often include technically-demanding, rapidly-changing, and widely-varying practices. Through the reporting and sharing of outcomes data and clinical practice, long-term collaborations develop implementations of research findings for better care. These efforts fit with the vision put forward in the IOM report, which suggested that, "in reshaping health care, local adaptation, innovation, and initiative will be essential ingredients for success," (2001, 33). With CQIs, a faster iterative process can occur with regular feedback of local and regional outcomes and adjustments to clinical implementation (Finks 2014).

Work completed in the state of Michigan has been at the forefront of an innovative first-of-its kind Collaborative Quality Initiative model. Collecting and coordinating data and activities across institutions takes resources and accountability. Blue Cross Blue Shield of Michigan funds 20 CQIs in a pay-for-participation model[2] that is based on the cost reduction and quality improvement gained from the CQI

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[2] *For further description of the Michigan Plan for CQI programs, please see: Finks 2014, 140-144.*

work. Blue Cross Blue Shield of Michigan considers the collaborative quality initiative work to be part of its Value Partnerships. This is akin to the work of CMS in value-based purchasing[3] and reimbursement incentives for quality improvement for various health goals. Results of these programs, such as Medicare's Hospital Value-Based Purchasing, have not always met or even gotten close to their original intentions (Figueroa et al. 2016). Blue Cross Blue Shield of Michigan puts the cost savings at an estimated $793 million across the state due to the work of the five oldest CQIs.[4] Approximately 80 hospitals are involved in the programming, with 90% of hospitals participating in at least one CQI.[5] Focus areas for BCBSM CQIs include the initial 1997 CQI convened to look at angioplasty to topics of trauma quality, oncology, urological surgery, bariatric surgery, and medicine safety, among others.[6] This model has had success, and indeed follows parts of the vision put forward by the 2001 IOM report. In a reflection ten years after the original report, the work started in a Michigan CQI for preventing bloodstream infections led to the first national success of better quality, implementation, and outcomes (Dentzer 2011). Dentzer called out the importance of the "social community" as being instrumental in to making the improvements.

CQIs[7] work through a combination of shared implementation goals coordinated centrally while enacted with iterations locally. All the sites collect data on outcomes and share it with a central repository. The leaders and members of the initiative participate in on-going collaborative activities such as conference calls, websites, and meetings. Representatives of participating institutions gather quarterly

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[3] *https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/hospital-value-based-purchasing/index.html?redirect=/hospital-value-based-purchasing/*

[4] *http://www.valuepartnerships.com/vp-program/quality-collaborations/*

[5,6] *http://www.bcbsm.com/providers/value-partnerships/value-partnerships-overview.html*

[7] *For the purposes of this paper, further references to CQIs will be specifically to those in Michigan, which use this structure.*

to review interventions while implementing changes and recording data sent to coordinating centers. The reported outcomes for each site or organization does not go directly to BCBSM, and is instead gathered and used for continuous improvement in the work of the CQI and eventually compiled for publishing and dissemination. Therefore, the organizational structure of CQIs, which are mainly housed at the University of Michigan, consist of both central physician leaders and coordinating centers that maintain data repositories, provide auditing and site visits for data compliance, and coordinate the efforts of the collaborative initiatives. Hospitals or Physician Organizations are then enrolled as participants in their respective CQIs according to factors such as size, interest, and patient populations.

Traditionally CQIs have depended on the same movement from medical research to practical use that is often part of quality improvement in general[8] (Wong 2014, 87). In fact, the mechanisms for implementing interventions that have been already researched and anointed as evidence-based practice are so common as to have become a new field of science. Implementation science, although separate from quality improvement, has been developed to cross the “research-practice gap” and move medical research findings into real-life practices (Nilsen 2015). Structured similarly to other areas of medical research and using classic scientific methodology, the field is struggling with itself. It explodes with theories and frameworks that are, “not necessarily better than common sense for guiding implementation,” (Nilsen 2015). The work of CQIs is based around common sense and common action.

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[3] *“Most collaborative programs have commonalities through different approaches used depending on the clinical scenario. Many interventions are evidence based and dissemination is based on accepted best practices. Other interventions are based on site visits which help examine and better understand organizational factors and culture, which can lead to better performance feedback, collaborative learning, and targeted interventions,” (Wong 2014, 87).*

Another traditional quality improvement tactic in healthcare is also at the heart of collaborative quality initiatives: the use of metrics as a performance motivator. What gets measured is what gets addressed. The choice of outcomes can be a powerful tool. As healthcare meets its goals for certain performance outcomes, new ones are set and health improves. This has been true of CQIs who continue to choose new metrics and goals as others are accomplished (Finks 2014). But the choice of which outcomes are measured and then tackled can also come from shifts in goals, values, and intentions. Whose choices these are becomes important. Choices are often made higher in organizations or more broadly nationally in a top-down manner. An institute for patient-centered outcomes (PCORI Patient Centered Outcomes Research Institute) was founded following the Patient Protection and Affordable Care Act of 2010, and is another example of a larger national scope. The move to emphasizing patient-centeredness and patient experience has also led to the use of the Hospital Consumer Assessment of Healthcare Providers and Systems (i.e., HCAHPS survey), a nationalized measure for patient satisfaction intended as a driver for hospital improvements.[9] Yet this national measurement does not necessarily work as a tactic on a local level. It does not offer the specific feedback needed for on-the-ground alterations (Epstein 2011).

To implement improvements on the local level, healthcare organizations must look beyond the metrics and outcomes and towards methods for increasing quality on the ground. Methods developed in engineering quality improvement for manufacturing have been used as models or directly applied to healthcare (Wong 2014). Lean methods arising from the Toyota Production System and Six Sigma methodologies are often referenced. Indeed, one Michigan CQI is devoted to implementing Lean programming. Nevertheless, Lean has limitations when applied to healthcare (Hasle et al. 2016). In reviewing the literature, Hasle et al. describe results that do not match the popularity, methods developed for the automobile industry that do not necessarily apply in

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[9] *Hospital Consumer Assessment of Healthcare Providers and Systems http://www.hcahpsonline.org/home.aspx*

healthcare settings, and outcomes that are mixed and often isolated to secondary functions and logistics. Barriers to the success of Lean methods in healthcare were firstly the complexity of the system, secondly the specialized focus of the professionals involved in care and in administration, and lastly the differing definitions of value (Hasle 2016). These barriers align with the notions of wicked problems listed in Table 1 above. Suggestions for improvement in lean include: avoidance of limited application in on-the-ground, ad-hoc teams without larger, organizational cultural involvement; better involvement for senior management in order to also address root problems; integration into the local and regional context with customization to each organization (Mazzocato 2010). Several of these limitations and suggestions are addressed in the structure of collaborative quality initiatives, such as including administrators and taking a longer-term approach to improvement.

Even though CQIs are described in opposition to the “top-down” approach of quality improvement (Jinks 2014), CQIs can remain biased to a top-down approach in terms of their structure. In putting forward keys to successful CQIs, even though Jinks rightly describes the critical importance of leadership in creating the participatory culture and community and providing a vision for the CQI, he contradicts himself somewhat when saying that the leader, “must also be able to interpret the collected data and use it to identify targets for improvement, while ensuring that the chosen interventions are based on current evidence,” (2014, 145). He talks about the importance of “consensus building” and participating in the design of interventions, but not of the decision making process. The movement from working after decisions are made to working before a decision is made, in the argumentative earlier stages of problem-solving, is described by Rittel as a hallmark of a second generation design methods (1984, 326). The reasons are those that are often cited in the health quality improvement fields as well: engaging stakeholders in the process helps implementation (Wong 2014; Hasle 2016; Rittel 1984).

INNOVATIONS OF THE I-MPACT COLLABORATIVE QUALITY INITIATIVE

The I-MPACT CQI moves past the current CQI structure into a newer sphere that welcomes additional argumentation, in the sense of open sharing of differing perspectives and opinions, and participation in decision-making. For example, the choice of data metrics, key to CQI efforts (Jinks 2014, 146), was completed over a year's time of working with local and regional participants. I-MPACT functions from the bottom-up even within its own teams and internal working style, a deliberate choice of its leadership. The result is an emphasis on collaborative in the collaborative quality initiative rather than the quality. The accompanying table on the following page lays out the activities of the two types of CQIs. In the I-MPACT CQI, interventions are determined last and arise from local groups working amongst themselves and in relation to others rather than determined first by the CQI physician leaders. The styles are characterized as top-down versus bottom-up.

Another way in which the I-MPACT CQI expands the structures of CQIs is who is enrolled. BCBSM collaborative initiatives typically either enroll hospital sites or physician organizations on topics that pertain specifically in their respective contexts. However, the problems in care transitions encompass both. Therefore I-MPACT enrolls clusters of hospitals and physician organizations that share patients, but that may or may not share working relationships in quality improvement.

Finally, I-MPACT pushes boundaries of quality improvement by also including patients and caregivers as participants. A shift to patient-centeredness is increasingly an aim of healthcare. In the context of collaborative quality work, including patients not only as participants in their own care but also in quality improvement work is an increasing and new opportunity (Wong 2014).

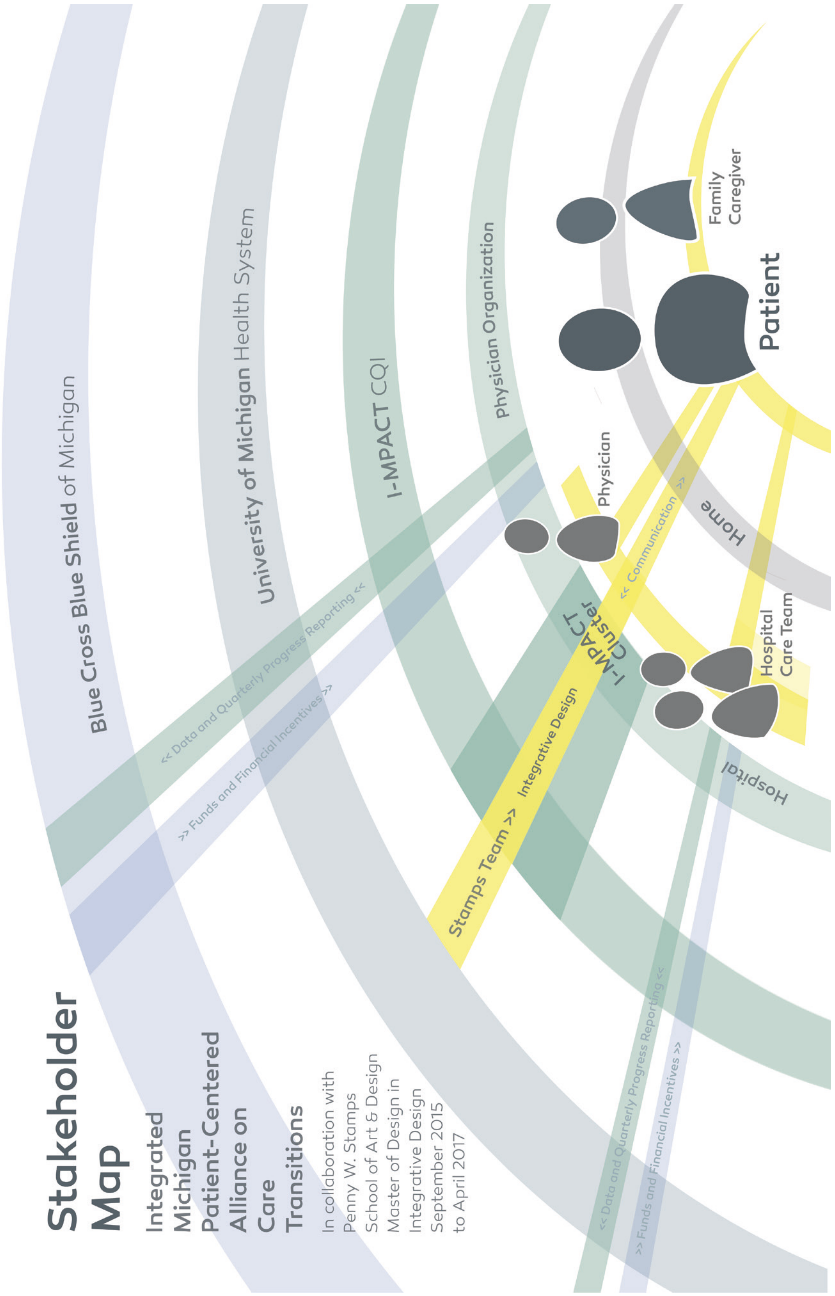


Figure 1. Patient-centric Stakeholder Map, yellow indicates MDes involvement

TYPICAL MICHIGAN CQI:

Collaborative **Quality** Initiative

Separate CQIs exist to address interest areas of groups of hospitals or groups of physician organizations.

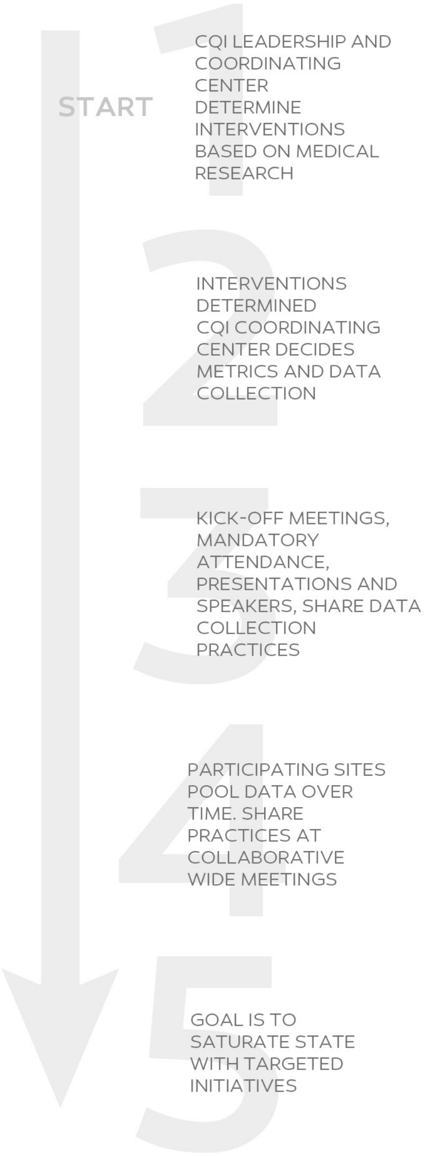
HOSPITALS

or

PHYSICIAN ORGS

The organization works from the top-down, with leadership determining direction and collaboration occuring more at the end of the quality improvment cycles, when data is pooled.

The structure of the organization puts the emphasis on the “quality”in Collaborative Quality Initiative rather than “collaborative.”



1 CQI LEADERSHIP AND COORDINATING CENTER DETERMINE INTERVENTIONS BASED ON MEDICAL RESEARCH

2 INTERVENTIONS DETERMINED CQI COORDINATING CENTER DECIDES METRICS AND DATA COLLECTION

3 KICK-OFF MEETINGS, MANDATORY ATTENDANCE, PRESENTATIONS AND SPEAKERS, SHARE DATA COLLECTION PRACTICES

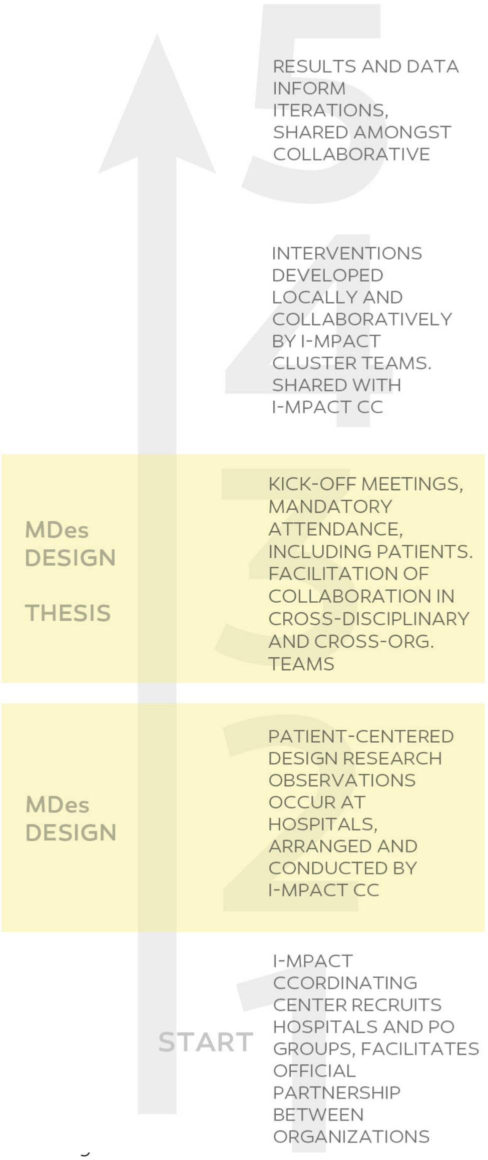
4 PARTICIPATING SITES POOL DATA OVER TIME. SHARE PRACTICES AT COLLABORATIVE WIDE MEETINGS

5 GOAL IS TO SATURATE STATE WITH TARGETED INITIATIVES

Figure 2. Diagram showing Top-down versus Bottom-up CQI structural approaches

I-MPACT CQI:

Collaborative Quality Initiative



RESULTS AND DATA INFORM ITERATIONS, SHARED AMONGST COLLABORATIVE

INTERVENTIONS DEVELOPED LOCALLY AND COLLABORATIVELY BY I-MPACT CLUSTER TEAMS. SHARED WITH I-MPACT CC

MDes DESIGN

THESIS

KICK-OFF MEETINGS, MANDATORY ATTENDANCE, INCLUDING PATIENTS. FACILITATION OF COLLABORATION IN CROSS-DISCIPLINARY AND CROSS-ORG. TEAMS

MDes DESIGN

PATIENT-CENTERED DESIGN RESEARCH OBSERVATIONS OCCUR AT HOSPITALS, ARRANGED AND CONDUCTED BY I-MPACT CC

START

I-MPACT CCORDINATING CENTER RECRUITS HOSPITALS AND PO GROUPS, FACILITATES OFFICIAL PARTNERSHIP BETWEEN ORGANIZATIONS

Local clusters of both hospitals and associated physican organizations are formally enrolled in the initiative together.

HOSPITALS

and

PHYSICIAN ORGS

with

PATIENTS

Patients and caregivers are also included in the CQI at multiple levels, both at the Coordinating Center and as part of the local clusters. Adding patients and caregivers is novel to the CQIs.

Also novel was the addition of design involvement from the MDes Integrative Design team in the Kick-off (described in this thesis) and in the development of a new observational process.

Result of these novel structural changes is an organization that is structured from the bottom-up. The work of the initiative starts with and emphasizes the collaborative before determining the specific quality interventions.

NEEDS IN THE DEVELOPMENT OF THE I-MPACT COLLABORATIVE QUALITY INITIATIVE

In summary, healthcare quality improvement, especially in the area of care transitions, can be seen as a wicked problem. When viewed in this way, the difficulty in successfully crossing the quality “chasm” from current to preferred states is partly because the tools, methods, and methodologies, often borrowed from engineering and Lean manufacturing, lose effectiveness when deployed in a wicked problem area such as healthcare. Design methods saw a similar need for innovation and change when moving from tame problems in engineering to wicked problems in urban planning. Healthcare quality improvement is likewise in need of a second generation of methods to address a second generation of problems. The involvement of designers collaborating with healthcare professionals on wicked problems in healthcare can be a way to develop this second generation of methods.

The means, methods, practices, procedures, actions, and activities to focus on the patient and involve specialist perspectives leave much room for improvement themselves. The nature of care transition issues and complexity “requires its own agenda and unique set of strategies,” (Coleman and Berenson 2004). The formation of Collaborative Quality Initiatives is one method that has been homegrown in healthcare and has seen some success, but it also needs further innovation.

In particular, two needs were essential to the mission of the collaborative while being unmet with current healthcare quality practices from either scientific research or engineering strategies.

Need (1):
New methods to accelerate cross-institutional collaboration.

The cross-institutional collaboration being created by I-MPACT was new. I-MPACT would be formalizing working relationships between clusters of entities that had separate practices, organizational structures, and institutional cultures. Once collected, these groups needed to function beyond pure implementation. Since all of the metrics and interventions were not being decided centrally by I-MPACT, these new cross-entity teams would also need to be a part of a decision-making process. What would it take to get collaboration not only from different specialists and disciplines, but also from different institutions? These groups needed to become working teams quickly. One part of the CQI structure is holding in-person kick-off days at the beginning of enrollment in initiatives, with later collaborative-wide meetings, conference calls, emails, and web-based interaction. A basic gathering of new groups together for a kick-off day was not enough when instead of a top-down presentation structure, groups needed to be able to make decisions within their groups from the bottom-up. How could participating healthcare organizations and clusters be efficiently set up to act as a team to identify their problems and interventions?

Need (2):
New approaches for involving the patient in the process.

Patients and caregivers are not professionals, and to include them in professional quality improvement work as participants is unfamiliar to everyone involved. How are patients and caregivers included in the process? How are patients not merely present in meetings, but also voices, collaborators, and team members?

INVITATION FOR DESIGN INVOLVEMENT

Faced with these needs and with unknowns at the initial stages of the I-MPACT CQI, before clusters were enrolled, its Director Dr. Lakshmi Halasyamani reached out to designers. Having experienced a three-day intensive design charette focusing on ebola,[10] where new groups of multi-disciplinary practitioners rapidly identified problems and created actual solutions, Dr. Halasyamani saw the potential for using such an energizing and outside approach in the collaborative work of I-MPACT.

Specifically, Dr. Halasyamani was interested in the design of full day event. CQIs require full-day kick-off events periodically as new participating organizations are enrolled and on boarded in the collaborative initiatives. These kick-offs typically occur in dimmed hotel ballrooms with powerpoint presentations, stacks of data printouts, and one-directional lectures from leaders and experts on the health topic. An attendee of one of these typical kick-offs described it as, “We sat there, and somebody from the CQI talked for a little while and then somebody else from the CQI talked for a while. Then, someone from Blue Cross talked for awhile. Then somebody else talked for awhile. Somewhere in there we had a break. Then we went to lunch.” A panel of doctors was the most engaging part of the day with people asking the panel questions and being able to witness a back-and-forth.

Even so, the requirement of a CQI to have a full day kick-off with mandatory attendance of a cross-disciplinary group of professionals held great possibility. Adding patients and caregivers increased the potential.

Therefore, a team of six graduate students in the Master of Design (MDes) in Integrative Design program at the University of Michigan Penny W. Stamps School of Art & Design was invited to collaborate and create a design-led, day-long kick-off event for clusters of hospitals and physician organizations newly participating in the Integrated

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[10] *http://stamps.umich.edu/creative-work/stories/ebola*

Michigan Patient-centered Alliance in Care Transitions Collaborative Quality Initiative.

The first of these kick-off events was held on April 8th, 2016. This model was then further iterated in collaboration between I-MPACT coordinating center and MDes team members. The next sections provide a narrative overview of designers collaborating with the I-MPACT coordinating center in creating the design of I-MPACT Kick-off Workshops, and in particular this author's work in developing the *Take Care* game. In the space of the 18-month collaboration, three kick-offs were held with newly participating members of I-MPACT. The clusters that started work in I-MPACT at the same time and attended the same kick-off are referred to as cohorts of participating clusters. The first cohort of enrollees is called the "Vanguard Cohort" by the CQI, as they were also highly involved in the early decision-making process of the collaborative's organizational and structural efforts. As of this date, three cohorts of Michigan hospitals and physician organizations have joined, with the goals of expanding throughout the state of Michigan. The accompanying table (Table 2) lists the three participating cohorts with their respective kick-off dates: April 8th, 2016, September 30th, 2016, and February 7th, 2017.

Table 2

I-MPACT Participating Sites

Vanguard Cohort April 2016	**Cohort 2** September 2017	**Cohort 3** February 2017
Beaumont — Royal Oak *United Physicians Group*	Genesys Regional Medical Center *Genesys Physician Health Organization*	Henry Ford Hospital — Wyandotte *Downriver Medical Associates*
St. Joseph Mercy — Ann Arbor *Huron Valley Physicians Association* *IHA*	Henry Ford Hospital — Detroit *Division of Academic General Internal Medicine*	McClaren Bay Region *Great Lakes OSC*
University of Michigan Health System / Michigan Medicine *University of Michigan Medical Group*	Henry Ford Hospital — West Bloomfield *Division of Academic General Internal Medicine*	Mercy Health St. Mary's — Grand Rapids *Mercy Health Physician Partners Cardiology*
	St. Joseph Mercy — Oakland *Oakland Physician Network Services*	Providence-Providence Park — Novi *Oakland Southfield Physicians* *The Physician Alliance*
	St. Mary Mercy — Livonia *Oakland Southfield Physicians*	St. John Hospital and Medical Center *The Physician Alliance*
		St. John Macomb/ Oakland Hospitals *Oakland Southfield Physicians*

Displayed by locally-based clusters:

Hospital Sites
Physician Organizations

Source: Adapted from "Participating Sites," Integrated Michigan Patient-centered Alliance in Care Transitions, accessed April 16, 2017, http://www.impactcqi.org/members/participating-sites.

Figure 3. Local Hospital and Physician Cluster at the April 2016 Kick-off

METHODOLOGY

Along with a team of five designers, I joined project partners and stakeholders early in I-MPACT's program development in order to work together, with, and for the improvement of care transitions in healthcare. The role of a designer in this case was similar to the one Rittel described as being typical of *second generation design methods*. It is one of a "midwife or teacher rather than the role of one who plans for others," who works to instead show, "others how to plan for themselves," (1984, 236).

Methodology

As a speech-language pathologist now working in the design field, I approach improvement efforts as a type of development. Familiar with language development across the lifespan from my professional background, my current design work pulls from my practice as an educator and communication specialist. The theories of the developmental psychologist Lev Vygotsky that envision learning thought and language as arising from interactions between person and their social environment are central in my understanding of development (Vygotsky 2012). I view my design work as developing human culture and scaffolding the learning required to do so. Although not fully developed nor described here, this work arises from an attitude towards improvement and development of organizations that involves purposeful actions and designed social contexts to spur experiential, social learning.

The process involved with this thesis was iterative, open-ended, and lived. Therefore the project will be described in this document in a narrative form. Context and explanation will be given in order to focus on how the two main needs involving collaboration and the patient role were addressed through one component of the work, the game *Take Care*. First, I describe how a pilot set of observations and interviews led to insights. Second, I discuss these insights in light of theory. Third, the results and outcomes of this process are described with a detailed account of the *Take Care* game. I emphasize how these aspects interrelate by returning periodically to the two needs and requirements of I-MPACT, the goal specifications targeted following insights and theory, and the connections to the actual designed work. The final section is a brief discussion with notes on limitations and an eye to future work.

Overview of Design & I-MPACT Collaboration

A timeline of the collaboration shows the long-term and evolving involvement of design with I-MPACT (Table 3). Before the design of a kick-off, in the fall of 2016, we spent time inquiring into the problem, identifying components of the wicked problem that eventually led into the two needs described above, and doing pilot design research observations to inform our work. Work then continued past the initial kick-off into the embedded designer presence of two I-MPACT internships, including the author of this thesis, over the summer months of 2016. In 2016-2017, these two members of the original design team continued to work with the coordinating center, assisting in two additional kick-off events with a total of 18 hospitals in participating clusters (see Table 2). In the final months of the collaboration, designers and I-MPACT CC worked closely together to prepare team members and materials for I-MPACT coordinating center to take on the facilitation of the designed kick-off activities starting in February 2017 and into the future. The next kick-off to on-board approximately five hospitals into the I-MPACT CQI is planned for September 2017.

The collaboration included a group of patient advisors. Designers were first introduced to members of Michigan Medicine's Patient and Family Centered Care (PFCC) program in the early stages. A group of e-advisors recruited via PFCC agreed to be advisors for I-MPACT via email. Several of these e-advisors became invested enough with the I-MPACT project that they also offered their perspectives in-person, becoming key collaborators and partners throughout this project. Members also spoke on patient panels and provided interviews. Even though their activities were beyond electronic communication, the group will be referred to as I-MPACT e-advisors throughout this thesis.

Table 3

Timeline of I-MPACT and MDes Collaboration

September 2015	Beginning of Collaboration between Integrated Michigan Patient Centered Alliance on Care Transitions (I-MPACT) and University of Michigan Stamps School of Art & Design MDes in Integrative Design Together attended Transform 2015 Conference at Mayo Clinic in Rochester, MN	*Team of six Master of Design (MDes) in Integrative Design Students: Manasi Agarwal, Aditi Bidkar, Kuan-ting Ho, Jiyoun Shin, Elizabeth Vander Veen and Kai Yu with MDes Program Director John Marshall begin collaboration with Dr. Lakshmi Halasyamani*
Fall 2015	Prepared for Pilot Observations Shared perspectives on the problem space of care transitions within the core team	*Dr. David Bozaan started to collaborate with the project and designers.*
December 2015	Met with members of University of Michigan Health System (UMHS) Patient and Family Centered Care (PFCC) for input on pilot observation procedures and on care transitions issues and experiences	*Pam James joined I-MPACT as Program Manager* *Tom Hoatlin, a patient advocate and Melissa Cunningham of UMHS PFCC participated*
January 2016	Held in-person Patient Advisory meeting with the I-MPACT patient e-advisory board Began observations	*Patient e-advisors joined I-MPACT*
February 2016	Completed pilot observations at UMHS Short Stay Units	*Beth Jones joined as Administrative Specialist*
March 2016	Interviewed seven e-advisors Completed pilot observations at all Vanguard sites	*Vanguard Clusters joined the collaborative work with designers*

June 2016	Two design students continued work officially as embedded members of the I-MPACT coordinating center (I-MPACT CC) Observations completed	*Manasi Agarwal (MA) and Elizabeth Vander Veen (EVV) began Design Internships at I-MPACT* *Anna Conlon as biostatistician*
July 2016	Development of new observational process; held patient advisory meeting; Play-test with patient advisors and I-MPACT CC facilitating	*Dr. Grace Jenq officially joined as co-director of I-MPACT* *Dr. David Bozaan became Associate Program Director*
September 2016	Observations at Cohort 2 sites Cohort 2 Kick-off held in Schoolcraft and facilitated by the MA and EVV with concurrent first Collaborative Wide Meeting hosted by I-MPACT CC	*Cohort 2 joined* *Further collaborations between MDes students and Vanguard sites regarding intervention development*
Winter 2017	Observations at Cohort 3 sites	*Cohort 3 joined* *Dr. Grace Jenq transitions fully to Program Director*
February 2017	Cohort 3 Kick-off held in Schoolcraft and facilitated by I-MPACT Coordinating Center with background support by MA and EVV	*Dr. Grace Jenq transitions fully to Program Director*
Spring 2017	MDes Exhibition displaying collaborative work in Ann Arbor, MI; hand-off of kick-off materials and game sets	*Completion of direct collaboration between MDes and I-MPACT*
September 2017	Cohort 4 Kick-off	

Pilot Observations by Designers

The project began by planning and completing a set of semi-structured pilot observations in the winter of 2015-2016. The aim of these observations was to trial having outsiders, particularly designers, observe patients and medical teams in the hospital environment. This was completed with an eye towards possibly developing the approach into a more systematized version for I-MPACT in the future. The arc of development for design research processes and dissemination in the larger I-MPACT project is discussed in Manasi Agarwal's University of Michigan 2017 Master of Design thesis, and the reader is referred there for further information. This section will briefly explain the nature of the pilot observations as they pertained to the development of the *Take Care* discharge game.

After a series of conversations with our physician collaborators at I-MPACT about current topics in the area of care transitions, the decision was made to focus our early observations on the discharge process. This decision led our further arrangements for the location, time, and type of pilot observation procedures. Because typical inpatient units do not have a large quantity of discharges per day, we first targeted a location with a higher frequency: the observational short stay unit. We made arrangements with the University of Michigan hospital and patient e-advisors from their Patient and Family Centered Care program to set up two full days of observations in their two short stay units, the Maize Unit and the Blue Unit. The design students completed the requirements and orientations required of hospital volunteers, including occupational health and safety's vaccination procedures and volunteer training sessions. Additional preparations included the writing of an informational sheet to provide to patients and caregivers about the observations. Collaborative decisions made in this process included how to approach staff and patients to ask for permission to observe their interactions with hospital staff as they[11]

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[10] *This writing deliberately uses the pronoun they as a singular, gender-neutral pronoun. This usage is prevalent in spoken English, although not typically used in traditional standard written English.*

got ready to go home, how to structure a phone call after they were home, and how to document the observations. Documentation was fully de-identified and included handwritten notes and sketches by the designers focusing on the process-oriented, environmental, and communicative elements rather than medical information.

The following is an excerpt of the description provided to participating hospitals detailing the pilot observational process:

> *Pairs of Master of Design (MDes) graduate students will conduct unobtrusive, in-person, contextual observations. Their focus will be on interpersonal, environmental, physical, communicative, behavioral and procedural aspects of the hospital discharge process, with special attention paid to patient and caregiver perspectives. These informal ethnographic observations will be documented with de-identified notes and/or sketches. Their observation periods (dates and time windows) will be pre-scheduled with specific hospitals and care teams.*
>
> *A subset of patients will also be asked for permission to follow-up by telephone after discharge to discuss specific aspects of their care transition. The semi-structured interview rubric is under development and will also be shared with appropriate hospital leadership and staff, patient advisors, and caregiver advisors to assure adequate opportunity for feedback.*

In order to gain a sense of what happens after discharge, once the patient was at home, we decided to follow up with patients directly via phone. The following questions were developed and reviewed with I-MPACT partners, the hospital site to ensure that they did not overlap with other post-discharge patient satisfaction surveys, and the I-MPACT patient e-advisory group. Having first gained permission on the day of observations to contact patients following discharge, the design team called patients five to seven days after leaving the hospital, and asked the following series of questions:

1. *What did you expect to have to do to care for yourself when you got home?*
2. *How was what you actually had to do to care for yourself when you got home different than what you expected?*
3. *Is there anything you can think of that would have made leaving the hospital and going home easier?*
4. *Is there anything else you would like to tell us about how you felt when leaving the hospital to go home or how you felt when you got home?*
5. *Is there anything we should do differently when asking other patients if we can observe them talking to hospital staff and doctors about going home, or when we call patients to follow-up with them?*

The first phase of observations included two full days spent in the two short stay units at the University of Michigan Health System. The team of six students split into smaller teams of two to three. We observed the staff and patients as actions, communication, and decisions were being made about discharge. Our initial loose and transparently evolving approach to these observations was not unlike that described by Glaser and Strauss in *Awareness of Dying*, the study that was later developed into the widespread and well-respected sociological methodology of Grounded Theory. The following is a portion of their description:

> The reader who is unacquainted with this style of field research need only imagine the sociologist moving rather freely within each medical service, having announced his intention of "studying terminal patients and what happens around them"

> to the personnel. The sociologist trails personnel around the service, watching them at work, sometimes questioning them about its details. He sits at the nursing station. He listens to conversations himself. Occasionally he queries the staff members, either about events he has seen or events someone has told him about, (Glaser and Strauss 1965, viii-ix).

Our goal was to observe the discharge process. It was an elusive target. After the first full day of observations with six observers in two units, we were only able to capture one full discharge and three partial processes. In response, we altered our observational tactic for the second day of observations, deciding instead to split the design team and follow nurses throughout the day, aiming to capture the entirety of touch points that happened with patients being discharged. One to two members of the design team also sat in the nurses' station to observe and speak with the associated staff including case managers, social workers, physician assistants, and nurse techs. Despite giving us a fuller understanding of the workings of the medical team, the decision to follow nurses likewise did not prove adequate in observing a full discharge process. Even though the nurses had the most frequent touch points with the patients, different activities that were completed by other team members on the floor or outside specialists were not seen, as they happened out of view of the nurse. These difficulties in seeing the whole process were not simply a flaw in the original observational approach, rather they informed our understanding of discharge as not being seen as a whole by outside or inside professionals.

Further iterations of an observational procedure were completed at the I-MPACT project's Vanguard cohort of hospital-physician organization clusters. Some of these prototype observations were not helpful in building an understanding of the discharge process. For example, observations of nurse clinicians implementing care transition interventions at Beaumont Royal Oak and Beaumont Troy offered a view of how current hospital-developed interventions look on the ground, but did not offer any insights into the typical discharge process. In the final iteration of pilot observations completed in Winter and Spring 2016, a subset of design students tried a different observational procedure at St. Joseph Mercy Health System following a suggestion of their staff at their Patient and Community Engagement Council and Patient Experience Advisor Program.[12] The new procedure was for one student to sit unobtrusively in a patient room all day on the day of discharge. Each touch point was recorded. Finally, a full discharge as experienced from the patient's perspective was captured. This observational procedure would be the basis for later development and refinement into working procedures for I-MPACT.[13]

Once completed, the pilot observation process covered seven visits to four hospitals with four different models: observing staff and patients fluidly inside and outside patient rooms, shadowing nurses, following nurse clinician interventions, and remaining inside a patient room. In addition to providing a way forward for future observations, the completion of these pilot observations included enough information for the designers to build a working understanding of discharge processes and insights into the current state of discharge. When combined with 18 responses to 40 follow-up telephone calls asking the questions listed above, our understanding only increased as we heard recent details and specifics from peoples' experiences. Additionally, seven in-depth structured interviews with members of I-MPACT's e-advisory board were completed by the design team. As opposed to the phone calls completed five to seven days following discharge, these hour-long conversations were often about experiences that had occurred further in the past, offering a more reflective perspective on the experience of care transitions and discharge.

Our pilot observations and phone calls were knowingly and

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[12] *The presence of volunteers as "experience advisors" in patient rooms was already a part of this hospital's procedures, please see http://www.stjoesannarbor.org/experience-advisor-program for further information on their programming.*

[13] *Please see Manasi Agarwal's 2017 UM MDes thesis for further information.*

purposefully diverse and flexible, as they were part of an explorative and iterative prototyping process for later development of a protocol for I-MPACT. The data captured was not intended for systematic analysis, rather for its practical use in developing an understanding of the current state of discharge processes. Because the aim of this thesis is to describe the development of a discharge game, further details and data analysis are not within the scope of this thesis. The information given above concerning the observation and interview process is meant to demonstrate the real-world origin of the following insights that led directly into the underlying intent of the *Take Care* game design.

Insights from Observations and Interviews

Following our completion of the series of pilot observations and interviews, we formulated insights into the actual state of the discharge process. This section provides a set of these takeaways grouped in three main themes. First, I will provide a working understanding of the nature of the discharge process that was built from our observations and interviews. This formed the basis for the game simulation of hospital discharge. The next two themes highlight insights into the two areas of need for I-MPACT: the type and nature of healthcare collaboration along with the role of the patient. These insights are not theories, but I find myself again along similar lines to Glaser and Strauss in that, “we wish to emphasize that the type of substantive theory developed in our book is often of great practical use long before the theory is tested with great rigor,” (Glaser and Strauss 1965, 293). The following insights are selected from the larger project in order to expand on their practicality for the development of the game. These design elements are referred to briefly in this section, but later in the thesis they will be described more fully. These are the insights arising from observations that were directly translated into the game mechanics in the *Take Care* game. The tie is direct from our experiential learning as designers to the design of a game that communicated that experiential learning.

1. Theme: Insights about the Discharge Process

We intended to observe the discharge process. It proved an elusive target. This can be seen by the fact that we needed four different models of observations in order to capture the sense of a "discharge process" in its variation and dispersion. We went looking for a discharge process and didn't find one. This led to the insight that:

1.1. Hospital discharge is neither a singular event nor a coherent process. Instead the term "discharge" is loosely used to refer to any or all of a series of tasks that must be completed by a set of professionals before a patient leaves the hospital. Each professional approaches the patient separately to complete complementary responsibilities. A doctor reconciles the medication lists with the pharmacy, a nurse provides education about how to use a new prescription, and a care manager arranges for durable medical equipment to be delivered.

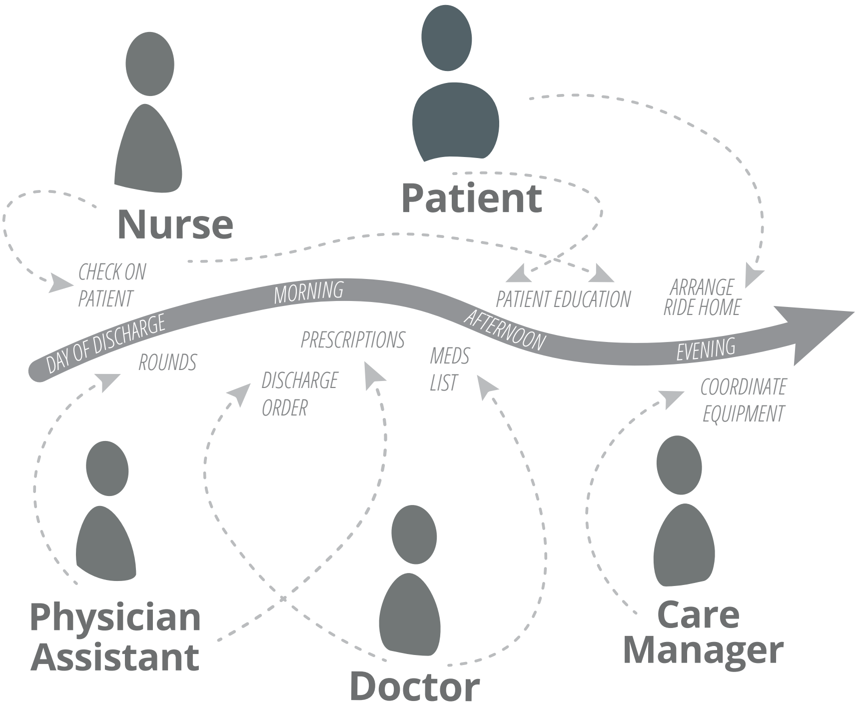


Figure 4. Schematic of Patient Journey on the day of discharge represented with central arrow on day of discharge, with healthcare professionals' major tasks and interactions.

1.2 Certain tasks are required before a patient is discharged, and these often must be done in a particular sequence. On the day of discharge, there are tasks that must be completed due to practical, institutional, and regulatory requirements. For example, to leave the hospital patients must physically leave the hospital, and arrangements must be made to get a ride home or transportation to another facility. Other tasks are required for hospital procedures, such as the provision of a discharge order and the steps that must be done by the doctor to complete that task. The specifics of this task might vary. For example, at one location doctors must complete a "discharge wizard" on the Electronic Medical Record (EMR). It is the process that officially registers a discharge order in the hospital system even though the decision might have been made and communicated verbally to the team prior to the formal completion of the task. Other tasks also require documentation, such as a checkboxes or notes on the EMR. One of these tasks can be nurse education. Nurses are required to provide education to patients, even though the type, timing, and quality of this education might vary within and between sites. Another large task area concerns prescriptions and what is called medication reconciliation. Because there is a transition from the hospital administering medications to the patients, families, or facilities where they will go, prescriptions must be completed and sent.

Even though not formalized, there tends to be a general sequence to these tasks. The detailed actions of patient education, gathering belongings, and arranging rides are completed after the doctor makes a decision to discharge. For doctors to decide about discharge, often they must gather current information on the patient earlier in the day. Some tasks may only be completed after there is a formal discharge order, for example removing the intravenous therapy (IV) or printing out the After Visit Summary (AVS), which is often given to the patient during nurse education.

1.3 Some tasks may be done by multiple staff members, while others can only be done by particular professionals. To prepare a patient for discharge, certain tasks can be done by multiple roles. For example, a nurse, nurse tech, or the patient's family member might be the one to push the patient in a wheelchair to the main entrance of the hospital. Doctors, nurse practitioners, or physician assistants could complete the task of writing prescriptions. Other tasks, however, can only be completed by those with particular training or institutional role. The doctor is the only person who may issue a discharge order. The nurse is the only person who provides nurse education. When seen in light of the sequential nature of discharge tasks, certain tasks can create bottlenecks, particularly around waiting for discharge orders. One patient characterized discharge as, "The doctor says 'discharge', and the hospital goes to work."

1.4 Breakdowns in the "discharge process" resulting in errors, delays, or frustrations, are frequent and often unpredictable. One nurse characterized discharge processes by being similar in that they are all different. Some patients are more complex and require additional steps or tasks before leaving the hospital, while others are more streamlined. Because there are many people involved inside and outside the hospital, there are many factors that the hospital cannot predict or control. A discharge time might be motivated from the patient's perspective according to their typical time for a smoke break. Or the patient might be ready to go at 11:00am, but everyone must wait for a ride from her family member who gets out of work after 5:30pm, for example.

1.5 Time is a driving pressure. Everyone, including the patient, would like the patient to be able to go home. The question and phrase, "when do I get to go home" is often heard in the vicinity of the patient, and the question and phrase, "will the patient be discharged?" is often heard in the hallway or nurses station. There is a motivation to discharge patients before another shift change and hand-off at the end of the workday. Hospitals also track hours and days that patients spend in the hospital as a measurement along with outcomes and others for billing purposes and quality improvement purposes. In addition, there are health-related motivations for wanting to get patients out of the hospital as soon as possible. People get sick from hospital-acquired infections, which is not in anyone's interest. For the short stay unit, the number of hours a patient has been at the hospital factors into the determination of how patients are classified, either as under observation or inpatient status. The time is closely watched as well as their eligibility for a change in status.

1.6 Discharge is messy by nature, and it is characterized by unpredictability and lack of coherence that results in waiting. Care team members must wait on others. For example, if a care manager needs information from a nurse while the nurse is with another patient, she must wait. Or, the doctor must wait on the lab results to inform a decision on whether to discharge. The nurse tech must wait until the final medications are administered before removing the IV and preparing the patient to leave. The patient must wait to hear whether she can go home today, and the nurse must wait for the patient's daughter to pick her up. Accommodations and waiting occur from everyone involved.

1.7 The patient is the only person who experiences discharge as a full process and often experiences it as the receiver of actions by others. The patient is the only connecting element between the entirety of the professionals and their discharge tasks. Often this is because the patient is the person whom the task is done to or for. They are the receivers of the actions by others. Prescriptions are sent for them, the IV is taken out from them, education is given to them. This is why the final observational model involved using the patient's perspective. They were the connecting factor.

2. Theme: Insights about Hospital Teamwork and Communication, corresponding to the first need of I-MPACT concerning cross-disciplinary and cross-institutional collaboration

Our experiences of being in hospital settings, working with healthcare professionals, and listening to patients' stories led us to develop understanding around the nature of collaboration in the healthcare setting. The following insights both led us to further identify I-MPACT's first need of developing collaboration, as described above, and to develop further specific insights into the nature of that requirement.

2.1 Healthcare is necessarily specialized, and that specialization often directs the focus of the work. Medicine is specialized for logical reasons. It takes years to build up an expertise to be able to diagnose and treat patients when the consequences and risks are high. It involves human life. Health auxiliary roles are also specialized. To learn the systems and rules involved with care management takes a particular knowledge base built up over time. Nurses must have training in order to perform their tasks.

The workloads of each person are determined by the particular expectations of those roles in their setting and profession. Therefore the caseload numbers vary. A social worker might be the person called for needs that might arise in a group of 20 to 40 patients, while a nurse might be completing all of the nursing tasks for 3 to 4 patients. A doctor might have 7, or 18, all depending on the day and on the setting. These numbers are given solely to show that the structure of workloads and caseloads is based on the specializations and individual tasks of the care team members and can vary considerably. The target is on the types of tasks that the specialized staff members can perform, and often on the number they can perform rather than a focus on the arrangement of work and teams around patients.

2.2 Individual persons are interchangeable within their roles, forming ad-hoc teams based on the identity of their roles in the system and hierarchy versus interpersonal team dynamics. Although there is great variation in the formation of teams and work groups between hospitals, floors, and units, healthcare in general is set up to allow for interchangeable persons who can fulfill professional roles. A patient needs a doctor and a nurse. The hospital needs a care manager and social worker to perform certain tasks. But the exact people within these roles can constantly change. During observations, a nurse at a later stage in her career, when introduced to the newest nurse on the unit, responded matter-of-factly that the name of the new nurse didn't matter, she would forget it like she had so many others. Scheduling, large staff sizes, and turnover are all factors in the complexity of medical teams. The services must be delivered by multiple people, because one person is unable to perform all the tasks with all of the knowledge required in order for the patient to receive care. The health system therefore requires hierarchy, because it quickly allows people to do the work that they are prepared to do by their training and expected to do in their role, and allows others to know what to expect. Hierarchy provides trust in the system and the training when time and situations do not allow for the formation of interpersonal trust through team building over time.

2.3 Communication is often difficult, disjointed, and inefficient, yet remains a major factor in team work. In working together, particularly for people who are not accustomed to working together, communication is key in doing multi-person processes such as discharge. In the case of patient health, it is vitally important. The Joint Commission, which is the accreditation organization for fee-based healthcare, cites communication breakdowns as one of three root causes of ineffective transitions of care (The Joint Commission 2012). Indeed, misunderstandings, missed opportunities, and miscommunications were recurrent throughout observations and patient stories. It was not only pieces of information that were missed, such as which medications a patient had already received that day, but also the type and style of communication that were overlooked. For example, a doctor and physician assistant pair who had never worked together before discovered their conflicting communication styles while speaking with a patient during rounds. One had a more direct style of speaking about the health effects of smoking, while the other preferred a more indirect approach. In this case, they had a brief, friendly discussion about it, recognized their shared opinion, and moved onto the next patient. Such discussions do not always occur, however, and misinterpretations seem common.

2.4 Care team members have limited understanding of the whole system and process. Knowledge about others' roles is limited to what is required for each individual to fulfill their respective role and responsibilities. Team members might know roles and have some assumptions about what those roles entail, but this understanding tends to be limited. For example, when a doctor was asked about how or whether a nurse's discharge report is incorporated into the main discharge summary, the response was, "nurses do discharge reports?" This arises naturally from the high workloads, limited time, and specialization of healthcare practitioners. Even so, the lack of understanding influences coordination. If someone is not aware that their actions are limiting the actions of others, time might be wasted and frustration incurred based on a limited realization of the context.

2.5 Decisions are made according to hierarchy. In the healthcare setting, the decision-making defaults to the person who is most in charge. On the hospital floor, this means that the doctor has the decision-making power. In the context of healthcare quality, it also often means that the doctors and the administrators naturally hold the decision-making. In care transitions, however, once the patient leaves the hospital, medical decisions become theirs. Or, if they leave to go to another healthcare entity such as a skilled nursing facility, the decision-making authority shifts to a new system. Working to improve transitions of care, therefore, is outside of the typical working mode for healthcare organizations. In the goals of I-MPACT, collaborative work would happen outside of the ingrained hierarchical structures. Involving participants in the decision-making process is also an important component of second generation design methods.

3. **Theme: Insights about the Patient's place in healthcare,** corresponding to the second need of I-MPACT in developing a role for patients

In coming to the issue of care transitions as outsiders, we as designers were most akin to the perspective of the patient. We didn't know the hospital jargon, classification systems, or internal processes. But we could see the human communication and interactions. Throughout, we felt the underlying tension with patients that is noted in the following insights and later developed into the later conceptualization of the use of the discharge game.

3.1 Discharge itself is a hospital-centric term, and is an example of the hospital-centric language of healthcare. One of our early questions concerned why often the first approach to addressing care transitions was to look at the discharge process. Why were we not asking how to get the patient ready to go home? Or even use the generic "leaving the hospital"? The connotations to the term "discharge" seem negative, and express the continuing framing of the problem as one of the hospital. Patients talk about "going home" and hospital staff more often use the term "discharge."

3.2 The patient is the only person who experiences the whole process and has the potential to be the connecting agent between disparate people, tasks, entities, and activities. This is similar to point 1.7
The patient is the only person who experiences discharge as a full

process and often experiences it as the receiver of actions by others. The emphasis here is on the potential that patients have to act as advocates of their own care. For example, one patient described how she would take her own notes and bring her own hard copies of information with her wherever she went, so that whoever was around her would be informed quickly and consistently. During a transition of care, the patient and/or caregiver is transitioning from receiving care by a hospital to acting their own. Instead of handing off to fellow doctors or nurses, on the day of discharge, doctors and nurses hand off responsibility to the patient and caregiver. The patient must take on the role of agent. Indeed, this can start in the hospital. One clear task that often falls to the patient is arranging a ride home from the hospital. There was a tension between the patient being both a receiver of their care and an actor in their care.

3.2 Communication with the patient can be overlooked. The patient is not a member of the healthcare profession. Language and style of communication must change when it occurs between a health care practitioner and a patient versus a healthcare practitioner and a fellow healthcare practitioner. It is not only the language, but also the approach to the patient. Often the patient is dispensed treatment. But communication is not dispensation. The patient must also be a person beyond a body and biological system that needs care. One interesting piece of the discharge process was when the patient got dressed. It could happen very late in the process of the discharge, sometimes just before leaving. Typically conversations about what to do when they got home and how to handle medication occurred when the patient was still dressed as a patient in a hospital gown. Berwick, when discussing his notions of patient-centeredness, used his experience as being treated both ways: as a doctor who is a fellow team member and agent, and then as a patient, “What chills my bones is indignity. It is the loss of influence on what happens to me. It is the image of myself in a hospital gown, homogenized, anonymous, powerless, no longer myself,” (2009, w564).

The people involved in communication must be receivers and givers of meaning. This requires healthcare practitioners to learn how to better seek out and receive meaning from patients when they are used to giving information. It also means that patients must be able to give information to healthcare practitioners when they are used to receiving.

3.4 The patient has potential to be a collaborator. Once the patient leaves the hospital, responsibility and decision-making about health returns to the patient without the context of a larger trained organization full of specialists. The patient is able to reach out to primary care and other specialists, but the responsibility for coordination rests with the patient. This means that the role of the patient is incredibly critical in improving quality of care transitions. There is great potential for patients to be collaborators in quality improvement for care transitions, but they are often not seen that way. In the healthcare environment, we observed a lack of trust in the patient by doctors and professionals (e.g., in interpreting behavior as drug-seeking). Patients' motives for seeking care were questioned, and not without reason. But this distrustful attitude set up more barriers and a return of distrust. Because they are not members of the healthcare establishment, providers cannot put trust into patients in the same way that they put trust into their fellow practitioners: by the place in the hierarchy, professional role, and prior training. Both patients and healthcare practitioners are unfamiliar with how to interact, work, and collaborate.

These insights are summarized in Table 4.

Table 4

Summary of Themes & Insights

1. Theme: Insights about the Discharge Process

1.1 Hospital discharge is neither a singular event nor a coherent process.

1.2 Certain tasks are required before a patient is discharged, and these often must be done in a particular sequence.

1.3 Some tasks may be done by multiple staff members, while others can only be done by particular professionals.

1.4 Breakdowns in the "discharge process" resulting in errors, delays, or frustrations, are frequent and often unpredictable.

1.5 Time is a driving pressure.

1.6 Discharge is messy by nature, and it is characterized by unpredictability and lack of coherence that results in waiting.

1.7 The patient is the only person who experiences discharge as a full process and often experiences it as the receiver of actions by others.

2. Theme: Insights about Hospital Teamwork and Communication, corresponding to the first need concerning collaboration

1.1 Healthcare is necessarily specialized, and that specialization often directs the focus of the work.

1.2 Individual persons are interchangeable within their roles, forming ad-hoc teams based on the identity of their roles in the system and hierarchy versus interpersonal team dynamics

1.3 Communication is often difficult, disjointed, and inefficient, yet remains a major factor in team work

1.4 Care team members have limited understanding of the whole system and process. Knowledge about others' roles is limited to what is required for each individual to fulfill their respective role and responsibilities.

1.5 Decisions are made according to hierarchy.

3. Theme: Insights about the Patient's place in healthcare, corresponding to the second need in forming roles for patients

3.1 Discharge itself is a hospital-centric term, and is an example of the hospital-centric language of healthcare

3.2 The patient is the only person who experiences the whole process and has the potential to be the connecting agent between disparate people, tasks, entities, and activities.

3.3 Communication with the patient can be overlooked.

3.4 The patient has potential to be a collaborator.

Theoretical Corroboration

The insights enumerated above resonate with theories developed about multidisciplinary professional groups and their methods of working. In particular, theories developed through a sociological grounded theory approach are useful in further unpacking the two main needs of building a new collaborative quality initiative at I-MPACT.

Groups of people who share a social world, actions, and connections can be termed *communities of practice* (Bowker and Star 2010). In the context of healthcare, this might mean a category as broad as "nursing" or "hospital administration." It is not limited to institutions or small groups of people. It is term similar to the common use of "silos", which is used conversationally to discuss the specializations of different professionals and practitioners, each with their own languages and ways of working together. They could be described as being vertically organized. An example of its use is in the following quote from conference proceedings of the Interprofessional Education Collaborative (IPEC), a group whose members are healthcare education professional organizations (the emphasis is mine),

> Most experts, including the conference sponsors and the IPEC panel, believe that in order to deliver high-quality, safe and efficient care, and meet the public's increasingly complex health care needs, the educational experience *must shift from one in which health profession students are educated in silos to one that fosters collaboration, communication and a team approach to providing care*, (IPEC 2011).

If the silos are *communities of practice*, then the shift into a team approach could be described as a shift into communities of interest. These are characterized by diverse communities of practice that have been brought together and, "defined by their collective concern with the resolution of a problem," (Arias and Fischer 2000, 1). In the I-MPACT context, these would be the local I-MPACT teams themselves, brought together by a common interest in the wicked problem of care transitions. The teams form at the local cluster level, consisting of physicians, hospital administrators, nurses, nurse clinicians, social workers, care managers, quality improvement specialists, physician assistants, nurse practitioners, primary care physicians, physician organization administrators, and patients and caregivers. The people involved vary depending on each local cluster. The Collaborative Quality Initiative of I-MPACT itself is a community of interest also focused on care transitions, but with a larger team.

Communities of Interest have particular challenges. Arias and Fischer describe such challenges as needing to form a shared understanding of their shared problem. The shared conceptualization is not immediate, and requires communication amidst different vocabularies (Arias and Fischer 2000). A part of the need and a part of the strength of communities of interest is that they have or must acquire a symmetry of ignorance. This terminology was first suggested by Rittel in describing the second generation design methods. As opposed to early approaches, the new methods would no longer rely on an asymmetry of ignorance, with one expert knowing the information and others deferring to the other's expertise. Instead many perspectives and an increased variety would be needed to generate responses to wicked problems. This means that not one person or group would know all of the information needed to approach the problem. There would be a symmetry of ignorance amongst the group (Rittel 1984). He described that the reason to create a symmetry of ignorance is because of the need for variety and additional generation of new ideas, this comes from having multiple people together offering opinions. Without it, one person having more expertise and knowledge than all the others would make a hierarchical decision limited in variety to only one perspective and experience, which might not be the one that is best.

To mediate between and among communities of practice and into communities of interest, people often make use of externalizations.

In the case of Arias and Fischer (2000), they developed incremental manifestations of the design process. Prototypes and architectural drawings as natural byproducts of the shared design work are common examples of shared externals described in the design literature. Another conceptualization of externalization is that of a boundary object. This is a name for (a) abstract or concrete objects that act as a commonality between communities of practice, that are, (b) “both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites”, as well as (c) being “weakly structured in common use” and “strongly structured in individual-site use,” (Bowker and Star 2000, 297). The conceptualization of boundary objects came from studying the heterogeneous work of science. Specifically from a group of scientists, researchers, professionals, and amateurs who together built zoology collection for a museum, each caring in different ways about the specimens collected and sharing a commonality in those specimens although not motives. The term boundary objects was especially brought up as a way in which groups can work effectively work on the same thing but without consensus (Star and Griesemer 1989; Star 2010).

Furthermore, boundary objects exist on a continuum of naturalization, with those in the community longer having more familiarity and less active attention paid to boundary objects. When newcomers join the community, the relationship, “largely revolves around the nature of the relationship with the objects and not, counter intuitively, directly with the people,” (Bowker and Star 2000, 298-99). Therefore the presence and attention paid to boundary objects would be important in creating new communities of interest around them.

The connection of boundary objects to this design work with I-MPACT at first was unclear. The game itself was suggested to be acting as a boundary object. But this does not fit Star’s clarification of boundary objects as being placed at the organizational work level, and also that boundary objects typically are not purposefully manufactured (Star 2010; Bowker and Star 2000). In our observations of the discharge process, we also did not see a clear object in “care transitions” or in the “discharge process” as being a clear object that connected the various communities of practice. I realized that the boundary object that currently connected the multiple professional disciplines gathered for the new formation of a community of interest around care transitions could be the patient. This fit with the three components of the boundary object described above: (a) each person’s work involved the patient, (b) the patient’s identify remained the same across sites and (c) everyone shared a relatively weak general notion of a patient when in a group together, but when separated into their own work tasks had a very specific notion of the type of work done with patients. For example, nurses have an entire classification system of their specific type of work done for patients (a classification system also described by Bowker and Star 2000). The loose notion that first connected these communities of practice who started work at the I-MPACT kick-off was, in fact, the patient.

This notion of patient-centeredness is uncomfortable. On its face this idea does not invoke tension: multi-disciplinary medical groups do find commonality in doing work to and for patients. But interestingly enough, when looked at it in terms of the piece of jargon *boundary object*, it does become uncomfortable. We do not want to call the patient an object, even though they are often the receiver of dispensed treatment and do act as an object of a subject-verb-object arrangement with healthcare professionals. Thinking of it in this way does give insight into the second need of I-MPACT, *new approaches for involving the patient in the process*.

If I-MPACT were to approach the formation of a community of interest in a straightforward manner, by focusing on the common element of a boundary object, a complication might occur with the part of its mission around patient-centeredness. In a typical formation of a community of interest with newcomers, one might emphasize a boundary object that might have been naturalized, in the way that we have habituated to the presence of light switches and electricity. "A naturalized object has lost its anthropological strangeness. It is in that narrow sense de-situated—members have forgotten the local nature of the object's meaning or the actions that go into maintaining and recreating its meaning," (Bowker and Star 2000, 299). Indeed, the generic patient can be naturalized in the system of healthcare, "the given" that becomes easy to overlook. But it is not simply a de-naturalization and recreation of meaning that needs to happen with the shared boundary object of patients in healthcare. It is actually a re-framing of the patient as a *person*.

This tension comes about as soon as a patient participant is included at the table of collaboration, as they are in the work of I-MPACT. A community of interest needs to be formed, but it also needs to include patients as members of that community. Patients bring with them a specialization in their own experience and lend an important perspective to the symmetry of ignorance. They bring an experience that the others might not know, while they gain the perspectives of medical professionals. But there is an underlying contradiction in having a patient, acting as participant, enter into a community of interest that defaults to common ground with a patient as an object of the work. Somehow, the boundary object of the patient must be re-situated as a participating agent. The boundary object must become something else, a different and perhaps new conceptualization, or shared abstraction.

The role of the patient is one that is unresolved in the healthcare community. The language used in describing patient-centered work reflects the unknowns, such as, "patients are needed, but the sport and team metaphor does not work here," (Wynia et al. 2012). In a review of theoretical frameworks from the field of implementation science that could be applied to the area of chronic care, only one included patients “as active contributors to clinical change,” while three others, “positioned patients as recipients of changes determined by others” or two who ignored the patient completely (Harris et al. 2017). In transitional care especially, the need remains for, “patient and caregiver to function as integral members of the different interdisciplinary care teams encountered across sites of care,” (Coleman 2003). Coleman mentions the need for studies, implementation science mentions the need for theories and frameworks. But for I-MPACT, the needs were different. The needs were for what to do when a table of healthcare practitioners was joined by a patient or caregiver to spend all day delving into a shared interest: making care transitions better for patients.

Therefore, in addressing the two needs of I-MPACT and using the theoretical terminology explained above, I can create even further specifications in the following goals:

GOALS / SPECIFICATIONS:

A. To foster a symmetry of ignorance within a hierarchical system, so that all voices are heard.

B. To provide activities that structure and support the creation of a community of interest from separate communities of practice.

C. To build a shared understanding through external means.

D. To demonstrate the tension between involving patients as participants and maintaining patients as the default boundary objects, and to model a method for involving patient participants.

APPLYING INSIGHTS AND THEORIES

The above insights developed from observations and interviews when combined with a theoretical understanding informed the way in which designers worked to address I-MPACT's needs. Although described sequentially in this thesis, the development of these needs, insights, and theoretical understandings were continuously overlapping and informing each other. For example, the explicit understanding through theory in the previous section largely came after tacit design decisions. The next section provides a narrative of the design of the main results and outcomes of the design work: an overview of the kick-off workshop day and a detailed discussion of the *Take Care* game.


1
Review chart and check Mrs. Green's vitals.
STATUS UPDATE
Must play STATUS UPDATE twice
PRESCRIPTIONS
DISCHARGE
2
DISCHARGE ORDER
Place discharge order in electronic medical record.
PRESCRIPTIONS

RESULTS & DESIGN OUTCOMES

The full day event of a kick-off workshop for I-MPACT was designed closely with input from their coordinating center (i.e., I-MPACT CC). The difficult and important work of officially recruiting and enrolling hospital sites and physician organizations into clusters for the collaborative quality initiative was done by I-MPACT CC. The clusters were also prepared with pre-work on the part of I-MPACT CC, who told them to have sites anticipate a design-led event, to expect an interactive working day, and to recruit and prepare patient and caregiver participants, and to dress comfortably and casually.

As of the writing of this paper, three kick-offs have been held. The first, on April 8, 2016, was located at the Integrative Design Studio at the Penny W. Stamps School of Art & Design. Six design students facilitated the small groups of the three Vanguard participants. The activities in this first kick-off were slightly different, but the goals were the same for all three. After the workshop-style activities, participating teams would leave with one to two well-founded problem statements and a large set of generated potential interventions. The double diamond framework from the UK Design Council was adapted as a design framework for the day. The first convergence point was on one to two problem statements and the day ended at the end of the second generating stage, three-quarters of the way through the double diamond. This gave clusters clearer next steps in selecting from the generated interventions.

The second kick-off was held at a different location, the Schoolcraft Tech Center, on September 30, 2016. I facilitated this kick-off along with Manasi Agarwal. The *Take Care* game had new rules with a new format, and this was when the last two activities described below, the patient journey maps and the care transitions timeline, were first introduced. Each cluster facilitated their working group amongst themselves. This set-up was to allow future kick-offs to be facilitated by fewer than the six designers who hosted each table at the first April 2016 kick-off.

The third kick-off was held again in Schoolcraft, Michigan on February 7, 2017. This kick-off was fully facilitated by members of I-MPACT CC, while Manasi Agarwal and I prepared and supported them. The *Take Care* game continued with largely the same rules as September, but with a different physical design and materials. The facilitation was also altered to accommodate two facilitators providing instructions.

These kick-offs are part of the broader CQI framework, and the specific design of I-MPACT's kick-offs will be carried forward on an annual basis as additional groups of four to five clusters are enrolled in the project. At the time of writing, next kick-off will occur in September 2017 without direct designer involvement, but with the same materials, training, and design of the previous kick-offs.

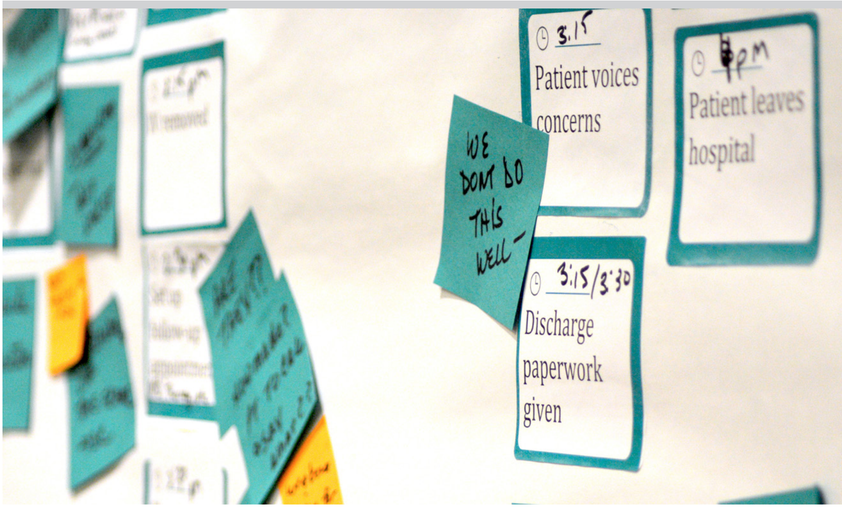


Figure 5. Example of Interactive team-based work on the Care Transitions Timeline

Four Main Activity Components

Figure 6. February 2017 Patient Panel Participants

1. Patient Panel

Full-group activity of all 45-60 attendees. A one-hour panel of two to three patient advocates who have completed training for being patient advocates and have had experience telling their stories in front of a group accept questions from the facilitator and participants.

Description provided to participants:

- *Patients will give us insight into their personal experiences.*
- *After we hear from our panel, we would like to open up the floor and hear from your patient participants about their experiences.*

The two main questions posed to the panel included:

- *Please share a discharge experience of yours and what you would have liked to have happened differently?*
- *What is one blind spot that you think care providers have where discharge/care transitions are concerned?*

Figure 7. February 2017 Kick-off

2. Game: *Take Care / Get Me Outta Here!*

During the kick-offs, the title of the game was Get Me Outta Here! This has been replaced with an alternate for this thesis *Take Care*. The game will be more fully described in the next section. Important to note here is that the game was played in the beginning of the day as the transition from full group activities to the small team working groups. It was also the first structured activity for this team interaction.

Description provided to participants:

- *Simulation of discharge through a collaborative role-based card game.*
- *Developed by designers from the Penny W. Stamps School of Art & Design at the University of Michigan specifically for I-MPACT.*
- *Based on observations at Vanguard sites.*

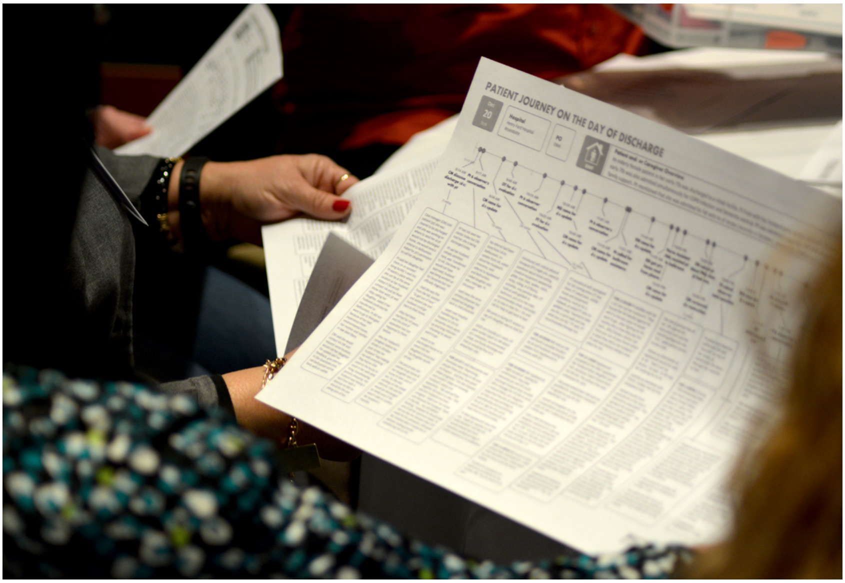


Figure 8. Participants at the February 2017 Kick-off reading patient journey maps

3. Patient Journey Maps

These visualizations of an actual patient's journey observed in each hospital location on the day of discharge were provided on 11x17 printouts and created following the development of the design research process for I-MPACT. For the design, development, and specifics of the patient journey maps, the reader is again referred to Manasi Agarwal's 2017 MDes thesis. These were developed largely in the summer of 2016, and therefore were not a part of the April 2016 kick-off.

Description provided to participants:

- *A visual representation of a patient's experience leaving your hospital.*
- *A tool providing a shared understanding of a patient's current experience.*

Figure 9. An I-MPACT cluster discussing at the September 2017 Kick-off

4. Care Transitions Timeline

The remainder and majority of the kick-off day was spent as working groups creating a shared visualization and understanding of an actual state of care transitions in their clusters. The day ended with each cluster team presenting to the entire group. This activity did not exist in the first kick-off.

- *This is the core activity, building a robust timeline of care transitions in your cluster's ecosystem.*
- *Pulling from patient journey map and from your own team's experiences to first develop a shared understanding of the current state.*
- *Continue building and using problem statements to give direction in generating interventions.*

Results: *Take Care* Game Design

The following section first gives a narrative account of the process for making the game, then details the rationale behind the development of the game, what the game is, its components, and how it works to meet its goals.

REPORTING THE DESIGN PERSPECTIVE THROUGH A GAME

Following our pilot observations and interviews, our project partners from I-MPACT and the participating hospital sites were looking for us to report our insights through a familiar form: a one-page report. Such a report would be typical of consultative or auditing roles, but our role was purposefully not one of the expert and certainly not one of an auditor. From our observations and interviews we had developed our own outside perspective, but to communicate our insights in a way that also addressed I-MPACT's needs was not possible within the format of a "one-pager" document. We had learned through experience and we wanted to share that learning experience. The method we used was a game.

WHY DECIDE TO DESIGN A GAME?

We did not expect to make a game at the beginning of the collaboration. In the manner of approaching wicked problems, we took each decision and reformulation of the problem as it came. As Rittel describes wicked problems and Herbert Simon describes ill-structured problems, once a problem is structured, the solution presents itself. Once we had formulated the particular needs of I-MPACT in the kick-off, a game became the most efficient solution. A game particularly addressed the main needs (1) for formation of collaboration and (2) for elaboration of the patient role as both boundary object and as agent, while remaining in itself a form of an ill-structured problem. Simon describes the game of chess as appearing to be a well-structured problem, but when the decisions and one-way nature of game play show, it is actually an ill-structured problem (Simon 1973). A game met the first need, and did so within the agenda for the kick-off: engaging teams early in the day and energizing the room around collaborative work. The following section describes how a game works towards these goals.

HOW DOES A GAME WORK?

Our aim is to provide experiential learning around the insights into I-MPACT's needs, and a game is a design of an experience (Schell 2014). A game design also accomplishes the aims effectively within the time and location constraints of I-MPACT's kick-off. "Play begins, and then at a certain moment it is 'over'. It plays itself to an end," (Huizinga 2014, 9). This separation from "ordinary life" is one of the most important characteristics of play (Huizinga 2014, 19), and is developed more fully by Salen and Zimmerman into their concept of the *magic circle*, a word borrowed from Huizinga (Salen and Zimmerman 2004).

Games invite people to enter into a *magic circle*, a space and time away from reality with a different set of rules (Salen and Zimmerman 2004). It is this general acceptance of the game rules as being above the hierarchical ones of real life that allow for more equal participation and leveling of that hierarchy (Dewey 2008). "Those who take part [in games] do not feel that they are bossed by an individual person or are being subjected to the will of some outside superior person," Dewey explains in describing the way that groups have social control as parts of communities exemplified through games (Dewey 2008, 33). This leveling of hierarchy was a need and an insight (see insight 2.5 above). Games are a method for learning by doing because they create experiences. They also allow for a certain amount of freedom in their play because it is not real life. This allows for a safe learning space, and especially in the context of care transitions, where mistakes in real life have vital consequences. The specific ways in which the *Take Care* game addresses the needs of I-MPACT and shares the insights from the designers' observations and interviews, and simulates discharge will be discussed after first describing what a game is and what the *Take Care* game is.

WHAT IS A GAME?

Salen and Zimmerman generate a definition of a game in their book *Rules of Play* that remains important in its comprehensive layout of schemas and frameworks for discussing game design academically. Their definition of a game is, “a system in which players engage in artificial conflict, defined by rules, that results in a quantifiable outcome,” (Salen and Zimmerman 2004, 80). This paper uses their definition in addition to embracing the more generalized attitude of Schell's statement that, “a game is a problem-solving activity, approached with a playful attitude.” (2014, 47). Salen and Zimmerman provide multiple overlapping schemas for looking at games, and this thesis will use their basic framework of a game working at the level of *rules*, *play*, and *culture* (2004).

Every game has *rules*, and the ones developed for the game *Take Care* are specifically designed to model reality and call attention to the insights gained from observations and interviews. The *play* emerging from these rules simulates the actuality of a team working together towards a goal. The encompassing *culture* of the game context is a very real part of games, as they are social mechanisms. In this case *Take Care* takes account of the current culture of communities of practice in healthcare and starts to push towards a newer culture of a community of interest around improving patient centered care transitions.

The game *Take Care* game is also a simulation. “Just as the imaginary situation has to contain rules of behavior, so every game with rules contains an imaginary situation,” (Vygotsky 1980, 95). The game acts as a model of reality. Bruce Archer, pioneer in the design methods movement, later describes design activity as “a distinctive process” that “operates through a medium, called modeling,” (1979, 349). Game design could be construed as a sort of modeling, particularly as it is simulating certain conditions. In particular, the *Take Care* game is a procedural representation (Salen and Zimmerman 20014) of hospital discharge. It is not a simulation in the way that a medical training procedure might be a simulation in as real of a context with true-to-life materials would be. Instead the procedures and process are represented through physical game boards and cards. Salen and Zimmerman describe the following four criteria for a simulation, which “arises from the operation of a system in which every element contributes in an integrated way to the larger representation,” (439).

1. *Simulations are abstractions:* The *Take Care* game chooses and limits what components of reality in a hospital discharge is taken into account. There are only five roles in the game, even though in reality a patient might have more than a dozen different professionals involved with care. The choice was to include the minimal amount of types roles that still provided a sense of their hierarchical and complementary relationships. The types were trimmed from an original seven roles to five.

2. *Simulations are systems:* The game is made of smaller components which also lend themselves to the whole abstraction. There are multiple parts interacting at once between the roles, the tasks, and the shared game board. This basic system of inter-relations is based on reality.

3. *Simulations are numerical:* The *Take Care* game is based on a numerical mechanism of five task types for three color types spread across 18 cards that must be laid sequentially. Salen and

Zimmerman state that, “the fact that simulations must reduce their subjects to formal, numerical values is exactly why it is so challenging to procedurally depict social, psychological, and other experientially complex phenomena in a game,” (2004, 440). The numerical components of the *Take Care* game are supplemented by brief narrative descriptions for each task, and the numerical system becomes the shared basis for the complexities of the human interactions to happen during the game play.

4. *Simulations are limited:* Simulations cannot take in all of reality. Indeed, the reality of discharge and of care transitions is too large and complex to contain fully in a game. The choices in game design were guided by the needs and insights developed, the requirements and specifications, of the design for I-MPACT.

What is *Take Care*: A Simulation Game of Hospital Discharge?

Take Care, also known as Get me Outta Here, is a game that simulates the day of discharge from the hospital. A collaborative, role-based card game, four to seven players act as a medical team to discharge three patients by completing discharge tasks in sequence. True to life, the game can be frustrating and confusing, but if teams are able to communicate and work together, they will find success, quality, and efficiency.

The game may be played as a single team competing against themselves, or in a larger workshop setting competing with six to ten teams simultaneously. The following rules describe the set-up and play of the larger group format.

Figure 10. Exhibited game components in March 10—April 1 Pathways Exhibition in Ann Arbor, MI.

Figure 11. Participant player setting up the game by distributing role name badges from a holder, February 2017

GAME OVERVIEW:

Take Care is designed to be played in a large room by six to ten teams simultaneously. One to two facilitators host the game by providing instructions from a facilitator's script, ensuring proper set-up, distributing materials, and hosting a debrief discussion after the game is played.

STAGE 1: Full-group set-up and instructions
(approx. 10-15 min.)

STAGE 2: Game play, completed in groups of 4-7
(approx. 30-35 min.)

STAGE 3: Full-group debrief and discussion
(approx. 5-7 min.)

LARGE GROUP SET-UP:

For large group play, materials are controlled according to the facilitator guide and summarized in the above contents table.

Teams are split into groups of four to seven people for gameplay. A game board is placed on the center of the table. During the directions phase, participants will be given role badges, informational cards detailing their roles and responsibilities, and a hand of cards. The patient player will be given a bracelet instead of a name badge as well as a clipboard and marker for keeping score through tallying hours.

CONTENTS:

- Facilitator's Guide
- Game Components and materials, see table 5.

Table 5

Take Care Game Components

PHYSICAL COMPONENT	# PER GAMESET	DESCRIPTION	WHEN & WHERE
Card Deck	1 per team	18 Card deck made up of 3 Patients with 5 Discharge Tasks each (shuffled) and narrative accounts to be read aloud	To be given to patient player during patient training and taken back to the team immediately before starting game
Game Board	1 set per team	3 patient journey “tracks” Reference directions	On holder, passed out table by table during instructions
Role Name Badges	6 per team	6 total 4 types of roles (Nurse, Doctor, Physician Assistant, Care Manager) with extra nurse and extra doctor badges for larger groups	On holder, passed out table by table during instructions
Role Name Badge Holder	1 per team	Identifies the role configurations depending on number of players on the team	Given to tables by second facilitator during instructions

PHYSICAL COMPONENT	# PER GAMESET	DESCRIPTION	WHEN & WHERE
Patient Wristband	1 per team	One temporary brightly colored wristband. (Patients don't wear name badges).	Clipped to Role Name Badge Holder
Roles and Responsibilities Cards in Envelope	1 per team	Describe the rules for each role, including what each player can play, and any special exceptions.	Underneath gameboard on table. Not to be opened until explicitly asked during patient training. Asked not to share visually.
Patient Tally Sheet With Clipboard and Marker With Envelope Reveal	1 of each per team	Counting sheet for tracking turns and ending of the game. Envelope with reveal for after 24 turns.	Prepared beforehand at secondary location in room. Given to patient players during "patient training"
Patient Roles & Responsibilities card	1 per team	The patient player's roles & responsibilities card, given as a second page to the patient tally sheet.	Given with patient tally sheet

Figure 12. Designating the patient player by wearing a wristband.

Figure 13. Patient player on the left marking the turns and hours, Sept. 2017

GOAL AND OBJECTIVE:

Players take on the roles of a medical team in a hospital. The goal is to discharge three patients as efficiently as possible in a simulation of the discharge process.

TEAM SET-UP:

Each team member chooses a role.
You may be any role except the one you are in real life.
There are five types of roles:

- Patient
- Nurse
- Doctor
- Physician Assistant
- Care Manager

Use the name badges with role names to assign roles.

To be true to life, patient players do not wear name badges. Instead, use a wristband to identify the patient player.

If you are in a group of 6, you will have two nurses. If you are in a group of 7, you will have two nurses and two doctors. If you are in a small group of 4, you will not have a care manager. Two of the same role may not sit next to each other.

HOW TO WIN:

The goal is to discharge all three patients as efficiently as possible. The team who discharges all three patients in the fewest turns, wins. Each player's turn stands for one hour. Patient players will count the hours no matter what happens or does not happen.

TO GET STARTED:

At the beginning, deal all the cards. Each person will have a hand of cards.

Keep your cards visible only to yourself.

Players take turns clockwise around the table. Each turn is counted by the patient player. The nurse goes first.

HOW TO DISCHARGE A PATIENT:

Before patients can go home, a series of tasks needs to be completed for each of them by the team.

The cards represent the tasks that must be completed.

Patients are discharged by laying the correct discharge tasks in sequence on the board.

Task 1: Update patient status
Task 2: Issue a discharge order
Task 3: Write prescriptions
Task 4: Provide nurse education
Task 5: Arrange transportation

END OF GAME:

The game ends when all of your discharge tasks are completed and the last of your patients gets a ride from the hospital.


Manager

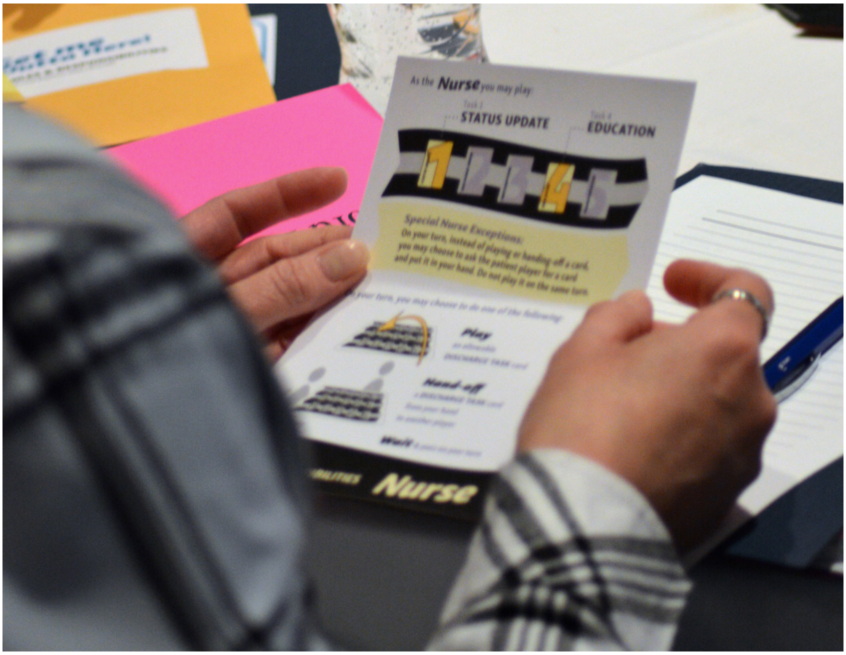
ON YOUR TURN:

On your turn you may either complete a discharge task or hand off a card to another player.

To complete a discharge task, lay a card on the patient board that corresponds to the discharge task color and number.

To hand off a card, give a card from your hand to another team member that could use it.

Sometimes you might not be able to do anything on your turn. You might have to pass. Even turns that are passed on get counted by the patient player.



Nurse
Care Manager
Nurse Practitioner
MERCY HEALTH

Nurse

RULES:

- You may not receive a card on your turn.
- Follow the directions on the cards. Each patient is different, some have additional, unexpected discharge tasks.
- Cards cannot be played out of order or on the wrong patient.
- Cards must be read aloud when played.
- You may not show any of your cards visually to each other.
- Not every player can play every card type. You must follow the directions on your roles and responsibilities cards. This game begins with hidden rules.

IMPORTANT NOTE:

In this game, you are free to communicate. Anyone can ask any player any question at any time.

HOW THE GAME ADDRESSES THE GOALS:

This section will describe how the game meets the main two needs, that were further specified by the following goals developed from insights and guided by theory.

A. To foster a symmetry of ignorance within a hierarchical system, so that all voices are heard.

The game creates an artificial symmetry of ignorance by first requiring everyone to take on a role that is not the one they have in real life. This is to demonstrate what they might not know about another role as well as force everyone at the table to be unfamiliar with their roles. Everyone starts the game equally ignorant.

Leveling the hierarchy is accomplished through the mode that is described from Dewey above. The game rules become the hierarchy. Also, an inversion of the hierarchy is encouraged, although not required, by the facilitators. Doctors are often encouraged to become patients.

The game is also new, unfamiliar, and confusing to everyone. Patient participants have often not experienced the type of workshop and quality improvement activities that occur at a CQI. There is an imbalance and asymmetry of ignorance of even the cultural norms in the setting. But in this new game, there is a symmetry of ignorance in that no one knows the game rules going in, and they can be confusing. Also there are purposefully hidden elements to the game. For a room full of professionals who do health quality improvement, asking them enter into an activity without full knowledge of the rules and metrics is putting them outside their comfort zone.

Finally, it is a turn-taking game. Each person and each role has an equal amount of turns and opportunities for communication.

The game rewards teams that are more communicative. The tasks are equally distributed and all must be played before the end of the game. Each task must be read aloud by the player when they play it. Each voice therefore is heard. Those who coordinate and communicate beyond this are even more effective, and are rewarded with a better score.

The more efficient, that is, the fewer hours and turns a team takes, the better the score. Lower scores are the goal.

B. To provide activities that structure and support the creation of a community of interest from separate communities of practice.

The game begins by simulating communities of practice. Each role is given specific rules about what they can do in the context of the game. Focus is put on learning what they can do, reading their individual roles and responsibilities cards, and trying to play the cards in their hand that they were dealt. However, the game also begins with a game board representing patient journeys in the center of the table. The objective to discharge these three patients as efficiently as possible is given at the very beginning of the activity. However this commonality is overlooked. The game is balanced in a way that after a few rounds of play, players get start getting stuck, and the focus moves from their individual roles based on abstract communities of practice towards a collaborative goal based around a community of interest.

The game also makes the team interact with each other. In order to play, cards must be physically handed from one person to another. Players need to talk and listen to each other in order to complete the game. An intention of the game is to simulate the system and therefore to show the communication that naturally arises from that system. Even though there are no rules around communication, teams often default to quiet concentration at the beginning and more discussion towards the end as coordination becomes paramount to completion.

C. To build a shared understanding through external means.

Through a simulation of the discharge process, including details on the cards that are based on real observations and interviews, the team begins to have a shared understanding of what a discharge actually is. Vocabulary is purposefully introduced during the game play, such as After Visit Summary, Meds List, and Discharge Order, in order to give everyone exposure to the jargon and language of healthcare practice that might be used throughout the working day. Not everyone at the table works on the floor in the hospital, and the discharge process is not a familiar one. Patients and caregivers can be especially left out of this knowledge and information. This gives everyone a working model for the remainder of the workshop. 82% (28 respondents) of an I-MPACT feedback survey who attended the February 2017 kick-off agreed or strongly agreed that the game was, “a credible simulation of the complexities of a discharge process.” One respondent strongly disagreed, showing that overall, it was a credible simulation for attendees.

D. To demonstrate the tension between involving patients as participants and maintaining patients as the default boundary objects, and to model a method for involving patient participants.

Patients are represented twice in the game. The two representations correspond to the two notions of patients as *boundary objects* and patients as participants and agents. The first procedural representation is that of the patient as a naturalized boundary object. It is the shared game board in the middle of the table in which everyone interacts but ignores at the beginning. The three colors represent patients whose stories are written on the discharge task cards. One patient color is particularly complex. The game board is purposefully of a journey, process, and steps. The game and the kick-off day aim to stretch the *boundary object* from defaulting to “a patient” and become more about the experience of a patient in a care transition, a care transitions service, or a discharge process.

The second representation of the patient is in the player at the table who takes on the patient role. There is also the actual patient collaborator sitting at the table who takes on a role other than patient. The patient player is set up with similar constraints to actual patients. This player is not given a name badge, rather a bracelet. They are the ones who track the hours and do the most waiting. Patient players can only complete one task: Task 5, arranging to leave the hospital. And they have a special rule around their actions: they can only hand off a card to another player when asked. The intention behind this rule is that the patient player sits as a member of the team around the table. They get an equal amount of cards. However in order to hand off cards to other players and be an equal member of the team, other medical team members must reach out to them. Often the power and the cards that they hold in their hand are overlooked until too late in the game, an occurrence that happens in real life, when a patient holds information and agency that is overlooked.

Therefore the game demonstrates the two roles of patients and the tension between patients as receivers of action and as actors. It does this by showing a version of how a system sustains certain behaviors. It does this not through theories and verbal explanations, but through allowing players to have an experience. In one playing of the game, a real-life patient advocate took on the role of doctor. After the game was completed and groups

> debriefed, a special exception was revealed to all the players: the patient-player had to be asked before handing task cards to another player. Suddenly, the real-life patient advocate, who had been playing a doctor in the game, realized that he had slipped into the very type of behavior that he worked in real-life so hard against. As a simulated doctor in the game system, he had not asked the patient player any questions. The patient-player had been ignored and not engaged, even by the actual patient advocate at the table. The role within a simulated system was enough to distract him from his core work as proponent of patient voices.

BRIEF OVERVIEW OF THE GAME DESIGN PROCESS

The *Take Care* game was developed over several iterations, from the first paper prototype that I brought to the MDes design team on index cards to a set of 10 fully realized playable products that included professionally printed cards and laser cut acrylic game boards.

After the observations and interviews were completed and an understanding of the needs for the kick-off day and activities were being formulated in collaboration with I-MPACT CC, we decided to make a game. The mechanics used to build the simulation were inspired from a variety of card games and board games. The collaborative building of a series by laying down numbers in a turn-taking format similar to the game *Hanabi*, designed by Antoine Bauza, seemed like a good basic core mechanic for simulating the collaborative sequential steps of the discharge with cards. But *Hanabi*'s rules around communication, the penalties for mistakes, and the remaining mechanics did not factor into this game. The free-form communication of the game *Pit* inspired the trading of cards and talking while the stops and starts of *Milles Bornes* inspired the mechanics for discharge breakdowns. *Pandemic*, designed by Matt Leacock, showed a way of using separate roles assigned to different players to contribute to a collaborative game play. Finally, the game *The Grizzled*, designed by Fabien Riffaud and Juan Rodriguez was a demonstration that a cooperative card game could be designed with an intention to share the frustrations of an experience, in this case the trenches of World War I, instead of a joyful winning. None of the examples provided an adequate structure to simulate the discharge process according to our goals and insights, therefore the game mechanics of *Take Care* had to be designed and playtested over an 18-month time period.

Three full playtests during kick-off events were completed, with intervening playtests with design faculty and design students. Importantly, a fourth playtest was completed with I-MPACT's e-advisory board and was composed of mainly patient players. Tests for facilitation of the large group gameplay were also performed with members of I-MPACT CC. Input from collaborators, participants, patients, and those inside and outside healthcare were all critical in development. We also received feedback from Jason Morningstar, the designer of Fiasco and a nursing education game among others, during the first full playtest at the April 2016 kick-off. His advice included working to make the game less brittle. At that time, the game was balanced to work with exactly six players, but the play had not been tested for other numbers. This was updated for a July playtest.

Many changes and alterations were made along the way, but overall the game had two main versions with four large group playtests. The biggest changes occurred after a patient e-advisory playtest in July 2016. We realized then that the game was simply too complex for its audience. It took too long to explain the rules to players who were not familiar with board games, making it not as efficient and slightly too complex to be accessible quickly to a diverse set of participants. I changed major game mechanisms after this playtest.

I essentially broke the original game apart and rebuilt it. The game played in July was well-balanced with its complex rules, and fundamental changes had to be made in order to significantly reduce the instructions and set up. For example, the end of the game shifted from being done after 24 player turns (i.e., one day and four rounds of play in the original representation) to being complete after all three patients were discharged and all the cards were played. In the earlier version, during the first half of gameplay, players drew a new card from the deck and different numbers of players started with different sizes of hands. There were leftover cards at the end. The final game dealt all of the cards, even if there were uneven hands. No cards would be left over at the end. The original game had two actions per turn, which was cut to one action. The deck size was cut almost in half. Teams competed not in how many patients they got discharged in a certain amount of time, but in how efficient they were in discharging all of their patients. A different turn counting mechanism was introduced, from a patient pawn token on a game board to a tally on a clipboard. The original game also included a larger mechanism for “caution cards”, which were drawn in the first two rounds and immediately played. Even though the surprise element was important, the rules around how and when to play caution cards were confusing and took too long to explain. This was replaced with a different sort of breakdown element in the final game, with certain tasks for patients requiring double work. To save the element of surprise, after 24 turns the patient player is instructed to read a card that requires one patient color to be completely reset and played again. After many iterations and playtests, the game is more accessible, less brittle, and more efficient in its goals.

DISCUSSION

"There must be a realization of what it is that is wrong, a location for the feeling of discomfort. This requires a picture of what is and of what ought to be, and a mismatch between these two pictures. There must be a discrepancy, something definitely identified as not being as it ought to be." (Rittel 1995, 2137).

"From science you can learn what is the case, and what has been the case, but you cannot learn what ought to be the case." (Rittel 1995, 2146).

This final section of the thesis further explores selected themes and discusses limitations and future work.

COMPLEX ADAPTIVE SYSTEMS:

Healthcare is a complex adaptive system (CAS), “a collection of individual agents that have the freedom to act in ways that are not always predictable and whose actions are interconnected such that one agent’s actions changes the context for other agents.” The nature of these systems makes linear approaches to quality improvement difficult, but approaching healthcare for what it is, a complex adaptive system, holds great potential for quality improvement (IOM 2001, 313). This thesis demonstrates how design methods are set up to approach wicked problems and join collaborators to do so. Furthermore, complex adaptive systems show that, “relatively simple rules can lead to complex, emergent, innovative system behavior,” (IOM 2001, 313). Games are also systems that create emergent behavior (Salen and Zimmerman 2004). This thesis could be viewed as using a game as a simulation of a complex adaptive system in healthcare for a healthcare audience. It provides an opportunity to have an approachable system before teams approach the even more complex one in reality.

ON THE OPEN-ENDEDNESS OF THE COLLABORATION AND IMPLICATIONS FOR EVALUATION AND ASSESSMENT:

The outcome of this design work described here, a game design, was not the outcomes expected at the beginning of the collaboration. This fits with the notion described earlier about the second generation of design methods and an open-ended procedure. One consequence of this approach and structure is the relative decreased amount of evaluation and assessment. Indeed, even making a formalized account of it is difficult. In the metric-heavy context of healthcare, this thesis does not have the weight of carefully constructed data-centric arguments. The arguments instead are those based on experience and argued through experience.

This ultimately fits with Rittel's description of a second generation of design methods as being argument based (1984). Our evaluation is also one that has been open-ended, using the success markers determined by our collaborators and participants. This has included feedback surveys completed and compiled by I-MPACT CC as well as personal opinions about whether the game fulfilled goals to have people interacting, talking, learning, and engaging. Other evidence for success of this game has included the fact that participants have taken copies from the September kick-off and initiated game play with their own teams.

Nevertheless, there is opportunity for development of success metrics and tools. A resource-intense choice would qualitative research from video data (e.g., the methods described by Heath et al., 2010). The constraints of this current project did not leave time, room, or resources for such research. But it could be an avenue for future validation or work. The development of customized rubrics to measure goals and successes would be another possible avenue.

Ultimately, the place of evaluation in the project must be as situated, contextual, and temporal as the collaboration itself. In this sense, this project included many discussions, check-ins, meetings, observations, and outside observers to continually make the decisions and arguments moving forward. I-MPACT did provide feedback surveys to participants after each kick-off and reviewed them as a team. Two comments from September 2016 specifically pertained to the game:

> *I think it would have been interesting to play the game a second time, to see what we learned from our mistakes the first time around.*
>
> *The game was too confusing and time consuming.*

One comment from February 2017 specifically mentioned the game:

> *Would have loved a second round of the discharge game to learn from our mistakes and improve outcomes.*

The suggestion of additional rounds is one area that the game could be expanded on. Jason Morningstar suggested trading team members between rounds, and a participant who has played multiple times suggested trading roles from one game to the next in order to show shift change. In this way, evaluation fed into further developments for practical use and can continue to do so.

Therefore, evaluation was embedded into the process of approaching this wicked problem and must be unique to each. "Despite seeming similarities, a new wicked problem may have particularities so unique that you cannot transfer old solutions," (Rittel 1997, 2626).

The framework for a design approach into the wicked problem of healthcare fits with the needs of the problems in care transitions and chronic care in a way that current healthcare implementation science frameworks do not. When existing medical implementation theories, models, and frameworks were reviewed specifically for applicability to improving service delivery and implementing changes in chronic conditions, none fully met the criteria formulated from chronic care management (Harris et al. 2017). Five factors were determined to be critical for improvement or implementation theories address: (1) structure that worked on micro, meso, and macro levels from assessment through action and evaluation; (2) applicability and range of focus beyond one active organization; (3) presence or openness for patient and carer involvement; (4) bases that were empirical or theoretical and clearly explained; (5) a protocol or guidance for measuring its own theoretical concepts. None of the reviewed theories addressed how to involve more than one organization. Only one explicitly involved an agent role for patients (Harris et al, 2017).

Therefore current theoretical bases in implementation science do not appear sufficient enough to address the needs of improving care transitions for patients. This work with I-MPACT particularly addressed the two areas that were shown to be most lacking in the review of frameworks, including participation of many organizations and the participation of patients and caregivers.

PRECEDENT PROJECTS:

Incorporating game play, and even custom games, into workshops is not a new development. Icebreakers are often mini-games played in workshop settings to get people interacting. At a basic level, the *Take Care* game does work as an icebreaker, with 85% of survey respondents who attended the February kick-off agreeing (16 respondents) or strongly agreeing (14 respondents) that it was "an effective ice-breaker", and 11% (4 respondents) somewhat disagreeing. Workshop games can also include simulations used to apply skilled learnings from the teaching. Lean quality improvement workshops sometimes include lean Lego games. Two of the I-MPACT CC members had recently attended these lean workshops and recalled much more information even weeks after the training from the portions of the training where they did more simulations versus the portions spent in the same training with traditional slide decks. The *Take Care* kick-off game was different in that the game was not a hands-on application of intervention skills and ideas. The game was more for discovery than for implementation. In proportion to the total time of the workshop, *Take Care* took up less time, as it was not intended as a training exercise.

Another game that has goals of communication and is played in a healthcare or a larger group context is *My Gift of Grace*, now renamed *Hello*, designed by Nick Jehlen and Jethro Heiko of Common Practice.

It starts conversations around end of life care by giving questions, structure, and physical manifestations of gratitude. *Take Care* is different in that it is a simulation game and based on an abstraction of reality in addition to its underlying goals involving communication, participation, and collaboration. The popularity and widespread use of serious games in healthcare to support interactions such as *My Gift of Grace* is something that these games share despite their large differences in intent and structure.

DIFFICULTIES AND LIMITATIONS:

Different teams from various organizational structures approached and experienced the activities of the kick-off day differently. In speaking with one participant who had attended all three kick-offs with three organizations, she described how some organizations are more ready and willing to enter into newer types of work than others. Tools such as the game were picked up immediately by a more open group and used even outside the kick-off context. Being able to identify and collaborate with organizations that are ready for this type of design work or quality improvement would be an important part of this type of work going forward.

The role of the patient remains difficult. Indeed, some patient participants have been able to be highly included in the work, one even being hired part time. But so far in the work of I-MPACT, good patient participation is not yet the norm. Recruiting and collaborating with patients to make the work patient-centered continues to have tension broadly in the healthcare realm and specifically with I-MPACT moving forward. Continued understanding and continual attention to patients and caregivers will be required.

Future Work

I-MPACT is expected to grow, and the kick-off and game design will be carried forward into the future as new clusters begin enrollment in the project. After working closely with designers, the project partners at I-MPACT coordinating center will be able to run similar workshops independently with supplied copies of the game. The next I-MPACT kick-off is scheduled for September 2017 as of this writing, and kick-offs are planned to continue on an annual basis.

Future work for the author will also continually develop. As a speech-language pathologist having completed a project in design, I find myself taking on models of those who also have a "tendency to self-subversion" such as Albert O. Hirschman, an economist and development practitioner. He wrote both for practitioners and also about the practice. Donald Schön describes Hirschman as being interested, "in a state of mind, a process of change and institution building in which learning is development," (1994, 293), which is an interest I share. Schön searched for a coherent theory of social learning underlying Hirschman's work, but only found fragments and "resonances" (1994). Schön describes missing evidence for an unstated premise in Hirschman's development approach,

> There are honorable precedents for the idea that a change in belief or attitude may follow behavior rather than set it in motion. But if inducement effects and forcing mechanisms must be designed in order to get more people to do the things that will cause them to acquire the appropriate beliefs, experience the appropriate feelings, and think in the appropriate ways, then there must be 'designers' who already possess these development-oriented virtues and are able to convert them to action, (Schön 1994, 78).

Perhaps these 'designers' as Schön calls them could be those who would already term themselves professionally as designers. The game described in this thesis has a purpose that aligns with this quote.

Unarticulated notions about development, learning, language, and design underlie this thesis work. Future work could look into a view towards the purpose and use behind externalizations in the design process. This work suggests that an externalization such as a game is as much of a design tool as a visualization of a product in process, a picture of a generative toolkit, a boundary object, or an in-process prototype. Building a theoretical foundation about design's role in the formation of concepts is an area for potential future work, as well as describing an approach that takes into consideration the importance of designing for communication and collaboration.

Much can be developed, and the attitude underlying quality improvement has much to speak for it. "Education as growth or maturity should be an ever-present process," (Dewey 2008, 30). Along with my quality improvement colleagues and collaborators, I aim to get things a little better every day. That is what I design to do.

Conclusion

This thesis demonstrates how designers acted together with cross-disciplinary partners in the I-MPACT Coordinating Center, stakeholders in the member organizations enrolled in I-MPACT, and patient and caregiver constituents to approach the wicked problem of quality improvement in care transitions. The goal was to understand the current state of hospital discharge and collaborative quality improvement in healthcare in order to foster decision-making about what ought to be in future states. Therefore part of the work was in the comprehending and conceptualizing the present state of healthcare quality improvement, hospital discharge process, and the role of the patient. These insights and understanding were produced through research into the secondary literature as well as primary observations and interviews described above. Another portion of the work consisted of responding to needs and goals of the collaborative process by sharing our experiential learning through the designing and playing of a game.

The nature of this work on wicked problems trialed a next generation of methods to improve quality in healthcare while being open-ended and adventurous. The designer's role evolved and responded to the project as it developed. Even though this thesis places prominence on one major design outcome, the *Take Care* game, the work is not limited to one method, one problem, or one solution. Instead the thesis work here is meant as a particular example of a general approach, a design approach that arises from a second generation of design methods.

> Let us imagine a 'first generation' in design methods. The methods of this generation would be like a linear train of steps: analyze, synthesize, evaluate and so on. What are left are little tools for use here and there. What are not left over are the grand schemes that might carry you through. Little discrete tools don't give you an overall approach, (Rittel 1997, 2706)

Nevertheless, to describe the work of such an approach requires the linearity of a written argument and the specificities of discrete tools. This thesis supplies such an argument, discussing first the larger healthcare quality improvement context and a description of wicked problems before moving to the specific context of the collaboration with the Integrated Patient-Centered Alliance in Care Transitions. The current state of collaborative quality initiatives (CQIs) was described prior to articulating two needs, or requirements, of this work and project, even though these two needs were not made explicit in this way until after work was completed. The collaborative project required (1) New methods to accelerate cross-institutional collaboration for action and (2) New approaches for involving the patient in the process.

A pilot observational process with accompanying interviews led to a series of insights about the problem of care transitions and the discharge process. These fed back into the notions of the project requirements after the addition of theoretical background, and ultimately into four main goal areas.

Following this contextual basis, I argued that the design of the game *Take Care* was designed to meet the requirements (i.e., needs) and specifications (i.e., goals) of the collaborative project. The game was not set out as a solution to care transitions. Rather it acted as an external device for creating communication with a new group of people around a new conceptualization. In this case, it created team communication around the ideas of hospital discharge and the patient role. By first showing a simulation of what is, it set teams up for creating and deciding on new interventions and new things that ought to be.

The discussion and written documentation of this collaborative project work took the form of more formal considerations of secondary literature as well as first-person narratives of the designing itself. The views and perspectives of the designer and author were described because they also influenced the view of the problem space. Even though designing occurred through a series of arguments between cross-disciplinary groups of people, as is integral to second generation design, a single overarching argument is not possible. To reduce the work to a singular argument structure or conventional scientific rhetoric would be to tame a wicked problem.

Therefore, to conclude and to be in line with the non-linearity of approaching wicked problems through designing and working collaboratively, I end by highlighting six aspects of this thesis.

Figure 14. Opening of the Pathways Graduate Thesis Show, March 10—April 1, 2017 in the Stamps Gallery, Ann Arbor, MI


MDes
Integrative Design
Manasi Agarwal
Aditi Bidkar
Kuan-Ting Ho
Ji Youn Shin
Elizabeth Vander Veen
Kai Yu
Integrative Pathways to Care
"I know they are busy and everything, but there ought to be some way that they could... ...make a patient feel like, I'm not just a set of symptoms. I'm a real person."
Making Inv
Taking Note

Our
Integrative Design
Approach

As a patient, healthcare comes in a jumble of people and places: doctors, waiting rooms, caregivers, systems, kitchen tables, diagnostics, nurse technicians, ambulance rides, therapies, medicine cabinets, hospital beds.

It's in the movement from one to the other, in the transitions of care, where human details can be accidentally brushed past too quickly, left to the side in the rush.

Centering on the patient perspective, the inaugural MDes in Integrative Design cohort worked together, with, and for our partners during a two-year collaboration in healthcare to improve care transitions.

After building relationships across disciplines, contributing an outsider's perspective, offering actionable insights from deep inquiry, and facilitating the development of shared strategies, we designed six complementary interventions. Each addresses a problem space that arose from the specific perspectives and needs of project partners, stakeholders and constituents, with emphasis and attention on patient voices.

DESIGN HIGHLIGHTS

Accelerating Cross-disciplinary Teams

Before cross-disciplinary work can be completed, it must be started. Collecting the necessary perspectives and voices from different entities, professions, and practices into one place and one project is a difficult first step. But once administrators, patients, doctors, clinicians, nurses, caregivers, quality coordinators, and case managers sit down around the same table in the same room for an all-day event, they are faced with an initial inertia. This must be overcome before dynamic work can be done.

Driving deliberate energy into team formation creates momentum for later outputs. Situated early in the Kick-off event, the team simulation *Take Care* quickly moves a cluster of professionals from being a group gathered around a table to a team actively gathering insights.

Leveling the Default Hierarchy

Hierarchy has its place in complex systems such as healthcare. But it falls out of place in collaborative work calling for multiple varied perspectives. If members of a group default completely to what is comfortable and familiar to themselves, they will default to what is uncomfortable and unfamiliar to others.

It is in considering the voice of a participant, beyond having a representative body in a chair, which brings value to cross-disciplinary work. This design sets up a bounded time and space, incites a common discomfort through an unexpected activity, arranges equal turns of action and speaking, and provides explicit rules around roles. The first rule: each participant must take on a role they are not in real life. Patients might become care managers, administrators might become nurses, and doctors might become patients.

Illuminating the Patient's Role

Patients can play an important and sometimes unrecognized role in their health, and therefore in healthcare. This simulation recreates the situation in which the information and power that the patient holds goes unrecognized, and is often not sought out until late in the game.

Patients and healthcare entities already share a priority: patient health outcomes. In working towards this goal, however, the role of the patient is in flux. Traditionally, patients are passive receivers of dispensed treatment. They are also active users of a service, customers of healthcare organizations, and agents of their own health.

Figure XX. Title

Modeling the Complexities of Collaboration

Because of its scope and complexity, collaborative work can be difficult to take into account, assess, and address for improvement. Observations, interviews, research, and theory contributed to the synthesized experience shown here, built to reveal the intricate human dynamics and difficulties that arise from collaborative and sometimes messy work.

Hospital discharge is neither a singular event nor a coherent process. Instead, the hospital-centric term “discharge” loosely refers to any or all of a series of discrete, complementary tasks that must be done before a patient leaves the hospital. Only the patient experiences the entirety of these discharge tasks as a process and a service. This human-scale model, in the form of a game, shares this perspective.

Communicating Outside the Norm

Effective communication is key to accomplishing collaborative goals. With years of accumulated practices, good communication in healthcare is not a given. Each specialization develops its own cultural norms, jargon, and linguistic shorthand. New shared communication is needed to support collaboration across disciplines, domains, and entities.

The game gives no instructions or mandates any constraints around communication. Participants are explicitly encouraged to ask anyone any question at any time. The implicit set up on individual responsibilities often overshadows the freedom to communicate. The most efficient teams are those who simply talk to each other.

Shifting into Shared Intent and Driving Results

Work must be done. The life and death stakes of healthcare alone mandate action for improvement. And when the improvement needs to happen in the transitions of care, in the gaps between entities, and in the missed connections, maintaining attention towards the whole is critical. Collaborative teams, events, and activities begin with parallel channels of practice and communication that once redirected to a shared interest, result in models for patient care.

Take Care begins by giving an explicit, measured team objective along with individual roles, responsibilities, and tasks. Despite a clear articulation of the goal and a visual reminder at the center of the table, it is often overlooked. By design, around the midpoint of the simulation, a shift occurs. Individuals get stuck. They wait. And if the team turns from concentrating on a set of narrow views to coordinating around a shared intent, they finish effectively and efficiently.

By engaging team formation, emphasizing new voices, delving into complexity, modeling collaboration, opening up communication, and clarifying joint purpose, this simulation prepares teams for real improvements with a shared perspective for better patient care.

References

Albert, Nancy M., Susan Barnason, Anita Deswal, Adrian Hernandez, Robb Kociol, Eunyoung Lee, Sara Paul, Catherine J. Ryan, and Connie White-Williams. “Transitions of Care in Heart Failure: A Scientific Statement From the American Heart Association” *Circulation: Heart Failure* (2015). doi: 10.1161/HHF.0000000000000006

Archer, L. Bruce. “Whatever Became of Design Methodology.” *Design Studies* 1, no. 1 (1979): 17-18.

——— “Viewpoint: Design, Innovation, Agility.” *Design Studies* 20, no. 6 (1999): 565-571.

Arias, Ernesto G., and Gerhard Fischer. “Boundary Objects: Their Role in Articulating the Task at Hand and Making Information Relevant to it.” (2000).

Berwick, Donald M. “What ‘Patient-centered’ Should Mean: Confessions of an Extremist.” *Health Affairs* 28, no. 4 (2009): w555-w565.

Bowker, Geoffrey C., and Susan Leigh Star. *Sorting Things Out: Classification and its Consequences*. MIT press, 2000.

Buetow, Stephen. “Back to Back: Medical Professionalism Requires that the Best Interest of the Patient Must Always Come First: No.” *Journal of Primary Health Care* 5, no. 1 (2013): 76-77.

———, and Glyn Elwyn. “The Window-Mirror: A New Model of the Patient-physician Relationship.” *Open Medicine* 2, no. 1 (2008): e20.

Centers for Medicaid and Medicare, CMS. “National Health Expenditures 2015 Highlights.” https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/highlights.pdf

Coleman, Eric A. “Falling Through the Cracks: Challenges and Opportunities for Improving Transitional Care for Persons with Continuous Complex Care Needs.” *Journal of the American Geriatrics Society* 51, no. 4 (2003): 549-555.

———, and Robert A. Berenson. “Lost in Transition: Challenges and Opportunities for Improving the Quality of Transitional Care.” *Annals of Internal Medicine* 141, no. 7 (2004): 533-536.

———, and Chad Boult. “Improving the Quality of Transitional Care for Persons with Complex Care Needs.” *Journal of the American Geriatrics Society* 51.4 (2003): 556-557.

Dentzer, Susan. “Still Crossing the Quality Chasm—Or Suspended Over It?.” *Health Affairs* 30, no. 4 (2011): 554-555, doi: 10.1377/hlthaff.2011.0287.

Dewey, J. “Experience and Education, Freedom and Culture, Theory of Evaluation, and Essays,” In *John Dewey, Volume 13: 1938-39, The Later Works, 1925-1953*, edited by Jo Ann Boydston. Carbondale: Southern Illinois (2008).

Epstein, Ronald M., and Richard L. Street. “The Values and Value of Patient-centered Care.” *Annals of Family Medicine* 9: no.11 (2011): 100-103, doi: 10.1370/afm.1239

Figueroa, Jose F., Yusuke Tsugawa, Jie Zheng, E. John Orav, and Ashish K. Jha. “Association between the Value-Based Purchasing Pay for Performance Program and Patient Mortality in US Hospitals: Observational Study.” *British Medical Journal* 353 (2016): i2214.

Finks, Jonathan F. “Chapter 12: Collaborative Quality Improvement.” In *Success in Academic Surgery: Health Services Research*, edited by Justin Dimick and Caprice Greenberg. Springer London, 2014.

Glaser, Barney G. and Anselm L. Strauss, 1965. *Awareness of Dying*, Chicago, IL: Aldine Publishing Company.

Harris, Melanie, Sharon J. Lawn, Andrea Morello, Malcolm W. Battersby, Julie Ratcliffe, R. Doug McEvoy, and Jennifer J. Tieman. "Practice Change in Chronic Conditions Care: an Appraisal of Theories." *BMC Health Services Research* 17, no. 1 (2017): 170.

Hasle, Peter, Anders P. Nielsen, and Kasper Edwards. "Application of Lean Manufacturing in Hospitals—the Need to Consider Maturity, Complexity, and the Value Concept." *Human Factors and Ergonomics in Manufacturing & Service Industries* 26, no. 4 (2016): 430-442.

Heath, Christian, Jon Hindmarsh, and Paul Luff. *Video in Qualitative Research.* Sage Publications, 2010.

Huizinga, Johan. *Homo Ludens: A Study of the Play-element in Culture*. Martino Publishing, Mansfield Centre, CT (2014) reprint of Roy Publishers, New York (1950).

Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century.* (2001). Washington, DC: The National Academies Press.

Institute of Medicine. "Appendix B: Redesigning Health Care with Insights from the Science of Complex Adaptive Systems." Crossing the Quality Chasm: A New Health System for the 21st Century. (2001). Washington, DC: The National Academies Press. doi: 10.17226/10027.

Interprofessional Education Collaborative. "Team-based Competencies: Building a Shared Foundation For Education and Clinical Practice." Conference Proceedings, Washington D.C. February 16-17 2011. https://ipecollaborative.org/uploads/IPEC-Team-Based-Competencies.pdf

The Joint Commission. “Transitions of Care: The Need for a More Effective Approach to Continuing Patient Care.” *Hot Topics in Health Care*. (2012). https://www.jointcommission.org/assets/1/18/Hot_Topics_Transitions_of_Care.pdf

Jones, John Christopher. “How My Thoughts About Design Methods Have Changed During the Years.” *Design Methods and Theories* 11, no. 1 (1977): 48-62.

Institute of Medicine (US) Committee on Quality of Health Care in America. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, D.C.: National Academies Press, 2001.

Jencks, Stephen F., Mark V. Williams, and Eric A. Coleman. “Rehospitalizations Among Patients in the Medicare Fee-for-service Program.” *New England Journal of Medicine* 360, no. 14 (2009): 1418-1428.

Kansagara, Devan, Joseph C. Chiovaro, David Kagen, Stephen Jencks, Kerry Rhyne, Maya O’neil, Karli Kondo et al. “So Many Options, Where Do We Start? An Overview of the Care Transitions Literature.” *Journal of Hospital Medicine* 11, no. 3 (2016): 221-230.

Mazzocato, Pamela, Carl Savage, Mats Brommels, Håkan Aronsson, and Johan Thor. “Lean Thinking in Healthcare: A Realist Review of the Literature.” *Quality and Safety in Health Care* 19, no. 5 (2010): 376-382.

Nilsen, Per. “Making Sense of Implementation Theories, Models and Frameworks.” *Implementation Science* 10, no. 1 (2015): 53.

“Participating Sites.” *Integrated Michigan Patient-centered Alliance in Care Transitions*. Accessed April 16, 2017. http://www.impactcqi.org/members/participating-sites.

Rethinking the Development Experience: Essays Provoked by the Work of Albert O. Hirschman. Edited by Lloyd Rodwin and Donald A. Schön. Transaction Publishers, 1994.

Rittel, H. W. J. "Second Generation Design Methods." In *Developments in Design Methodology*, edited by Nigel Cross, 317-327, John Wiley & Sons, 1984.

——— "Impressions of Architecture 130 Notes and Observations on Professor Horst W.J. Rittel's Classic Design Methods Course at Berkeley as Taught circa 1969-71." *Design Methods: Theories, Research, Education and Practice* 32, no. 1 (January 1997): 2601-718.

——— "Impressions of Architecture 130: Notes and Observations on Professor Horst W.J. Rittel's Classic Design Methods Course at Berkeley as Taught Circa 1969-1971; the Spring 1969 Course." *Design Methods: Theories, Research, Education and Practice* 29, no. 1 (January 1995): 2111-196.

———, and Melvin M. Webber. "Dilemmas in a General Theory of Planning." *Policy Sciences* 4, no. 2 (1973): 155-169.

Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. MIT press, 2004.

Schell, Jesse. *The Art of Game Design: A Book of Lenses*. CRC Press, 2014.

Schön, Donald A. "Hirschman's Theory of Social Learning." In *Rethinking the Development Experience: Essays Provoked by the Work of Albert O. Hirschman*, edited by Lloyd Rodwin and Donald A. Schön, 67-95. Transaction Publishers, 1994.

Simon, Herbert A. "The Structure of Ill-structured Problems." *Artificial Intelligence* 4, no. 3-4 (1973): 181-201.

Sobo, Elisa J., Candice Bowman, and Allen L. Gifford. “Behind the Scenes in Health Care Improvement: The Complex Structures and Emergent strategies of Implementation Science.” *Social Science & Medicine* 67, no. 10 (2008): 1530-1540.

Star, Susan Leigh. “This is Not a Boundary Object: Reflections on the Origin of a Concept.” *Science, Technology, and Human Values* 35, no. 5 (2010): 601-617.

———, and James R. Griesemer. “Institutional Ecology, Translations’ and Boundary Objects: Amateurs and Professionals in Berkeley’s Museum of Vertebrate Zoology, 1907-39.” *Social Studies of Science* 19, no. 3 (1989): 387-420.

Vygotsky, Lev Semenovich. *Mind in Society: The Development of Higher Psychological Processes*, Edited by Michael Cole, Vera John-Steiner, Syliva Scribner, and Ellen Souberman. Harvard University Press, 1980.

———. *Thought and Language*, Translated and edited by Eugenia Hanfmann, Gertruda Vakar, and Alex Kozulin. MIT press, 2012.

Wong, Sandra L. “Chapter 7: Using Data for Local Quality Improvement.” *Success in Academic Surgery: Health Services Research*. Springer London, Edited by Justin Dimick and Caprice Greenberg. 2014.

Wynia, Matthew K., Isabelle Von Kohorn, and Pamela H. Mitchell. “Challenges at the Intersection of Team-based and Patient-centered Health Care: Insights from an IOM Working Group.” *Journal of the American Medical Association*, 308, no. 13 (2012): 1327-1328.