Quantitative Ethnography in the Clinic

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Introduction

Many of the most pressing challenges in healthcare are characterized by considerable complexity. Sub-systems of people and technology interacting in environments combine to complete health care processes, including the actual provision of care as well as supporting processes (e.g., environmental services). Those interactions are what dictate the success of health care processes - including facilitation of patient-centered care and decision-making, control of hospital-acquired infection, and management of care transitions - and thus cannot be functionally decomposed and improved through simple procedural approaches. That is, health care is a complex sociotechnical system, and research on health care needs to reflect that complexity [1]. Further, these complex systems are characterized by uncertainty and competing demands [2]: health care professionals and patients must make decisions with incomplete and/or uncertain information; understand and balance trade-offs; account for numerous demands, including those of patients, hospital administrators, and insurance providers; coordinate care across multiple contexts and caregivers; and exercise clinical judgment. Trainees must learn to do these while mastering basic knowledge and skills.

The coronavirus pandemic of 2020 brought global attention to the importance, fragility, and resilience of our health care systems. The QE-COVID Data Challenge demonstrated the ability of Quantitative Ethnographic (QE) methods to interpret health care-related data in a unique way, which can inform health care professionals about pertinent results. While the efficacy of QE methods in COVID-related data is being addressed by other symposia, this symposium directs attention to wider applications in health care where QE methods have been applied or can be applied with promising results.

Symposium Structure and Goals

In this symposium, we bring together five leading QE experts who are working in the health care domain. Each expert will discuss their ongoing work in various application areas:
doctor-patient communication, shared decision-making (SDM), quality of care and patient safety, medical education for students and practitioners, policy-level decision-making and best practices. Our goal is to highlight the breadth of ongoing QE research in the health care setting. Through discussion with the audience, we hope to stimulate interest of other QE researchers in the domain, foster collaborations, and identify next steps to grow the impact of the QE community in health care. In addition, we expect audience members to leave with an appreciation for the trans-disciplinary nature of QE, as each speaker comes from a unique field (Zörgő: medical anthropologist; Ruis: historian of science, medicine and technology; Wooldridge: human factors and systems engineer; Jung: educational psychologist; Popov: team learning scientist).

Doctor-Patient Communication

Doctor-patient communication is a fundamental part of clinical work; it is ubiquitous throughout a physician's career and constitutes a pivotal aspect of effective healing. Patients primarily judge their doctors based on their manner of communication, and these interactions determine patient satisfaction to a great extent. Good doctor-patient communication has been shown to correlate with better cooperation and increased adherence [3], as well as improved patient health [4]. The doctor-patient consultation can be seen as an exchange of worldviews and explanatory models of illness (i.e the cause, meaning, and preferred treatment of illness).

Due to the fact that many issues in doctor-patient communication can stem from differences in explanatory models, hermeneutic analysis is needed to explore worldviews, distinct perspectives, and specific narratives to pinpoint misunderstandings, disagreements, and miscommunication. In large amounts of qualitative data (e.g. semi-structured interviews, focus groups), salient cognitive patterns are difficult to identify in a reliable way, as qualitative methods are tailored to in-depth examinations of smaller populations. Most qualitative analyses are detailed and take a multitude of factors into consideration. Patient explanatory models of illness, for example, depend on and interact with clinical characteristics (diagnosis, prognosis, available treatment options, etc.), demographic characteristics (patient age, sex, education, etc.), and psycho-social-cultural factors (values, beliefs, social network, information-seeking behavior, etc.) and so on [5]. In order to see which factors are most prominent and how they interact with each other, one needs an analytical method that captures this complexity. Epistemic Network Analysis (ENA) enables the visual inspection of a wide variety of interactions not only among patient attributes (e.g.

clinical and demographic factors), but also among relevant psycho-social- cultural constructs within patient narratives. By creating post-hoc subgroups within a sample (via conditional exchangeability), prominent cognitive and behavioral patterns can be identified. A model of complex interactions in qualitative data within a single visualization denotes a useful analytical tool, but it also signifies a powerful communication tool. When conveyed to practitioners or medical students, the network models also serve as effective means of representing the results and elaborating recommendations.

Shared Decision-Making

Clinical use of SDM—to meaningfully engage patients in the determination of their own care through the process of collaborative deliberation with health care providers on treatment options and the alignment of decisions with informed preferences—is widely seen as ethically imperative [6]. Policy leaders promote SDM not only for ethical reasons but also to improve health care efficiency. In the United States, SDM is one of the most widely promoted strategies to (a) reduce overtreatment and inappropriate care, (b) improve patient satisfaction and compliance with treatment recommendations, and (c) reduce variance and inequity in care provision [7].

Yet as clinicians, ethicists, and patient advocates have argued, promoting or requiring widespread implementation of SDM through policy initiatives may have significant unintended consequences if we can't reliably assess whether and to what extent SDM is appropriately implemented. It is difficult to measure the extent to which SDM affects health care utilization because there are no effective assessments of the SDM process that can be reliably applied at scale. For example, it is unknown whether SDM reduces unnecessary or inappropriate surgical procedures because there is variability in the extent to which SDM is implemented in clinical practice, and there are numerous, complex factors affecting health care utilization that may override the ability of SDM to determine care. Understanding the relationship between SDM and health care utilization requires large, multi-site studies, as SDM is used variably and effect sizes may be small. In the absence of such studies, policies that promote SDM may incentivize a model of decision making that addresses neither clinical nor ethical aims. To understand whether and to what extent investment in SDM affects health care utilization, new measures are needed that can assess whether, how, and to what extent SDM occurs in clinical encounters at scale.

QE provides an approach that could address this significant measurement challenge in health care. SDM is typically assessed either through patient surveys, which capture outcomes better than processes and often overestimate the extent to which practices like SDM are implemented [8], or through expert observation, which is costly and time intensive. Thus a key challenge is to develop reliable computational models that can replicate experts' qualitative judgement, making it possible to conduct more objective

assessments of SDM at scale. Because, SDM is characterized by discrete discourse elements, linear (though iterative) progression, discursive interaction, and collaboration, QE provides a rich framework for developing such models. Research in QE suggests that classification algorithms can be developed that reliably identify key indicators of SDM, and ENA and techniques for modeling sequential patterns can capture interaction, progression, and collaboration. Indeed, this approach has proved valuable in assessment of clinical performance [9, 10], and extension to patient-clinician communication is a key next stage in the development of novel assessments in health care.

Health Care Quality and Patient Safety

Health care has a quality and safety problem: as many as 440,000 people die due to preventable medical error in United States Hospitals each year [11]. However, improvement has not been easy. Health care is a complex sociotechnical system – in order to achieve improved outcomes, we must consider interactions, relationships and interfaces between sub-systems and system elements [1]. Disciplines such as human factors and systems engineering – which focus on designing and optimizing systems and systems of systems – have tools, methodologies and theories to successfully apply systems thinking and make demonstrable progress [12]. The impact of these methods would be enhanced by improved ability to understand, analyze and visualize relationships and interactions between and within systems. QE unifies qualitative and quantitative data and methods to rigorously understand, analyze and visualize human cognition, behavior and interactions. Thus, QE is posed to make substantive contributions through methodological tools and philosophical underpinnings to make progress in improving quality of care and patient safety, in particular when applied in combination with human factors and systems engineering knowledge, theory and techniques.

One example of such an application is the interface in between systems in health care, i.e., the care transition. Care transitions are transfers of information, authority and responsibility for patient care from a clinician or a group of clinicians to another and are opportunities for information loss and harm as well as error detection, correction and resilience [13]. QE brings many approaches that could be used to improve care transitions. For example, ENA can help model and quantify relationships between system elements and factors that influence care transitions as well as accompanying communication and coordination processes. These models are useful to compare and evaluate different system designs as well as different stakeholder groups, e.g., with an in person handoff or not or perspectives of different clinical disciplines.

Medical Education

Medical education has begun to move to competency-based training programs [14]. In such programs, milestones that physicians should be able to achieve independently by the end of their training period are identified. Then, mechanisms for training and assessing these competencies while allowing for individualized and formative feedback are developed. This form of continuous formative feedback on performance is becoming the norm in undergraduate and graduate medical education. However, once they have completed their training, practicing physicians are largely left on their own to figure out how best to keep current with their practice and learn new knowledge and skills. All practicing physicians need continuing certification activities (CCA) in order to maintain their medical license, but the suggestions provided for doing so are diverse and often lack evidence of effectiveness [15]. As such, CCA as part of Continuing Medical Education (CME) is moving toward specialty-specific experiences based on individual learning needs. CME in surgery is working towards achieving a tailored approach, utilizing individualized methods, such as coaching and simulation training. Practicing surgeons seem to have different needs based on their experience, and as they gain experience, appear to focus less on what not to do or errors and focus more on how to handle complex situations [16]. While in-person or video-based coaching or simulation training may be viable alternatives to historical forms of CCA, we currently do not understand how the interactions and conversations between trainers, mentors, or coaches and practicing surgeons working on developing new knowledge or skills influence the success of individualized CME [17]. This can be a particular challenge if these interventions are done remotely or asynchronously. QE can be a tool for developing models of these relationships and interactions. For example, research is beginning to provide insight into characteristics that may make people particularly good coaches. However, we do not know what about their coaching interactions make them especially effective. By modeling these conversations using ENA, we can explore not only what components of these learning sessions are important but how connections among elements in the conversations may impact successful CME relationships. These methods can also apply in other professions that require continuing education, such as law, counseling, or architecture.

Policy

The American College of Surgeons Accredited Education Institutes (ACS-AEI) provides a variety of learning experiences for practicing surgeons, surgical residents, and medical students using simulation-based education. Since 2005, ACS-AEI Consortium established standards for how simulation-based surgical training should be offered at Accredited Education Institutes in order to improve patient safety and promote the development of new techniques, technologies, research, and collaboration. As a part of the accreditation process in 2011 the ACS-AEI also added the identification

of best practices to recognize centers for their innovations as well as to share these practices and advance the field. Best practices are viewed as "areas far exceeding the accreditation standards or novel methods of advancing high quality, impactful education" [14]. The ACS-AEI as an organization began to collect and systematize all best practices from accreditation reviews for dissemination to members of the ACS-AEI Consortium. Essentially, the ACS-AEI organization provides a forum for its members to share and learn from innovative approaches to common problems in simulation-based surgical training, ranging from curriculum development and evaluation to management and governance models and scholarly activities that advance the field of surgical education. In addition to sharing these innovative approaches, the compiled list of 337 best practices provides a rich source of data to understand not only the evolution of the field over a decade but also the evolution of the accreditation process and organizational perspectives.

ENA, a quantitative ethnographic technique for modeling the structure of connections in data, is a well-suited methodological approach to gain deeper insights into the communications from an accrediting body to its individual members over almost a decade. ENA is usually applied to systematically identify a set of meaningful features in the verbal and nonverbal data sets of individuals or teams [18]. Literature reviews, videos, newsletters, and workshops, comparative analysis of accreditation data have been previously utilized to compare postgraduate program accreditation processes. However, ENA is a useful technique for modeling how the ACS-AEI is communicating to its members because it can model the relationships between all best practices as they occur within the accreditation reviews, and therefore understand how the accreditation process is changing over time. ENA methods are generally applicable to other domains and disciplines by utilizing the power of dynamic network models. Importantly, insights gained from studying medical education and healthcare setting can be applied to a wide range of other high-risk industries, such as aviation or energy production.

Conclusions

In academia, one frequently encounters the divide between quantitative and qualitative research methodologies. Specifically in health care, the former is commonly thought of as more "objective" and "scientific", while the latter is conceptualized as "subjective" research yielding "soft data" that does not easily lend itself to clinically relevant findings. This methodological dichotomy shrouds a difference in worldview as well: quantitative methods often adhere to the positivistic worldview (succinctly: there is one reality/truth, which can be measured, understood, controlled), and qualitative methods to the constructivist worldview (succinctly: social reality is co-constructed, there are multiple truths). These philosophical stances seem dichotomous, but the pragmatist appreciates that they are instrumental in answering vastly different research questions.

Quantitative methods are apt for questions such as how often a certain phenomenon occurs, while qualitative methods are appropriate for answering what a phenomenon means to those experiencing it. The ability to address both "horizontal" (frequency of a phenomenon across a population) and "vertical" (meaning and context of a phenomenon) dimensions usually comes at a price: if one broadens their horizon of scrutiny, they inevitably sacrifice depth and vice-versa. QE caters to the epistemological preferences of positivistic, constructivist and pragmatist sensibilities by undertaking the unification of methodologies (via contextualized numbers and quantified narratives) and the unification of domains (breadth while maintaining depth). This unified methodology is especially well-suited for research in health care, as it is always from the interplay of biological, psychological, social, and cultural factors that illness and healing emerge.

QE and associated techniques, such as ENA, also provide a way to summarize and compare qualitative findings in ways that are digestible to those not familiar with qualitative research. Key differences and patterns can be represented, displayed, and discussed with clinicians and other stakeholders in the health care system in ways that allow for an understanding of how the findings relate to their practice. In addition, complex patient interactions can be analyzed in ways that make sense of patterns of relationships that occur across practitioners and patients to try to better understand complex medical decisions, such as the decision to have a major surgery or determining end-of-life care. In this way, we can work to bridge the gap between research into the practices of those in the health care system and the impact on areas such as medical training, shared decision making, and patient satisfaction, without losing our appreciation for the complexity of these environments.

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