Caring: An Undiscovered "Super Ility" of Smart Healthcare

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Abstract

As new and exciting applications emerge using smart technologies, the Internet of Things, data analytics, and others for healthcare, a critical problem is emerging: the potential loss of caring. While these exciting technologies have improved patient care by allowing for better assessment, surveillance, and treatment, the use of technology can disassociate the caregiver from the patient, essentially removing the "care" from healthcare. Here we introduce the notion of caring as an undiscovered ility that ranks at least as important as other well-known ilities in healthcare systems.

Keywords: smart healthcare system, internet of things, requirements, ilities

Healthcare Ilities

Consider a complex, smart healthcare system, whether it is an assistive or therapeutic device, record management system, diagnostic system, physician order entry system or any hardware/software system related to healthcare. The intention of building these systems is to improve the degree of certain qualities or attributes (ilities) such as availability, privacy, reliability, safety, security, and more over their non-intelligent counterparts. Collectively, systems that focus on these qualities are intended to improve health outcomes, reduce cost, and enhance quality of life. These technologies, however, can affect the patient's perception of caring in a way that is not captured completely by any other quality or group of qualities.

Consider for example, the leveraging of the Internet of Things (IoT) to build smart healthcare technology to reduce cost and improve the quality of care and outcomes. It is not apparent how a healthcare system, for example, that monitors a patient and delivers medications or anesthetics can "care about" the sufferings, feelings and emotional needs of the patient. We need to more effectively capture the notion of caring so that we can somehow build that into a system that leverages existing (or future) commercial IoT components and services.

Caring: the Undiscovered "Super Ility"

Caring is a qualitative behavioral attribute that encompasses aspects of many attributes (including those mentioned) but it is far more. Caring can be defined as a noun, verb, or adjective. Definitions of caring abound in dictionaries, and have been defined in other professions both inside and out of the healthcare arena. In trying to define a notion of caring that is meaningful to systems engineers, computer scientists,

and, most importantly patients, it is advisable to consider the views of those in the profession which regularly is rated as the most trusted because of its reputation for caring: nursing.

Definitions of caring and related terms can be found in nursing literature and through various professional nursing organizations and health care institutions. Caring can be described as an act, or a way to approach a patient. Caring can be a trait that one possesses, and often an adjective to describe what is perceived to be a "good" nurse. Lachman points out that "Caring and nursing are so intertwined that nursing always appeared on the same page in a Google search for the definition of caring" [1].

For this discussion, we adopt caring as an adjective with the following definition:

"displaying kindness and concern for others" [2].

This simple definition allows for an exploration of caring in relation to smart healthcare systems, without being too specific to a particular specialty of nursing or to healthcare in general. The notion of "displaying kindness and concern" leads one to picture a relationship between the nurse and patient. This relationship will look differently when applied to a traditional face to face encounter without technology, versus in a smart healthcare application incorporating technologies such as remote monitoring or applications in the IoT.

Caring as defined above is not unique to nursing or health care, but it is an appropriate definition to illustrate what we mean by caring. Ilities can be organized into subsuming hierarchies based upon context, application, and environment and in healthcare systems, at least, we contend that caring subsumes the other ilities previously mentioned and several others. Seeking improvement in any or all of these other qualities out of concern for the patient is a part of caring, but it is not enough. There is much more to caring than system optimization and because the other ilities are subsumed by it, we call caring a "super ility."

A Nursing Perspective on Caring

Nursing is often described as an art and science, and caring discussions have taken place from both of these perspectives. Nursing is also a human science that incorporates the art of caring – for the 14th straight year, nurses have been rated as the most honest, ethical profession [3]. This high rating has been built on a relationship that combines trust, caring and a personal connection with the public.

Nursing theory has helped to define and build a scientific body of evidence concerning the profession. There are many nursing theories that focus on caring or aspects of caring. For example, Watson's Theory of Human Caring/Caring Science is one of the most recognized and studied theories. Watson developed her theory in the late 1970s, and from its inception, it has served to distinguish nursing from other health care disciplines, and to highlight the unique work of the profession. There are several core concepts of the theory; the one that most likely relates to smart healthcare systems and caring is a focus on the transpersonal caring relationship. The transpersonal caring relationship encompasses a moral commitment to protect and enhance human dignity, honoring another's needs and wishes, honoring the wholeness of the person, not just the physical self, maintaining balance, connecting to human beings,

consciously doing and being with another, and honoring the connection through authentic presence [4]. At the heart of nursing is the intention to care for the whole person and Watson's theory has provided that guidance for nurses in a multitude of practice settings. Watson's theory could be applied to a smart healthcare system to explore the transpersonal caring relationship in situations that encompass the use of remote technologies.

Measuring Caring

In relation to nursing research, Jean Watson developed a tool that has been used to assess perspectives of caring practices: The Watson Caritas Patient Score (WCPS) [4]. The WCPS is a survey instrument based on a 7 point Likert scale that rates caregivers on certain caring practices. The assessed caring practices include the environment, concepts of trust, meeting human needs, and feeling valued. The WCPS has been translated into five languages, and different versions exist to assess the caring practices of hospital staff, colleagues and peers.

Nkongho developed another scale -- the Caring Ability Inventory [5]. This instrument is self-administered, and uses four theoretical assumptions; caring is multidimensional, we all have the potential to care, caring can be learned, and caring is quantifiable. The work of Watson and Knongho provide theoretical support for measuring caring, and tools to assist requirements engineers, systems builders, and test engineers to evaluate their systems from this perspective. In addition, these measures could be used to compare different systems and provide opportunities to improve the overall quality of healthcare delivery.

Whatever mechanism is used to measure caring, the degree to which a patient feels cared about is in the perception of the patient. Static mechanisms, such as measuring contact time or analyzing words exchanged between caregiver and patient, can provide quantitative evidence of caring, but only if the patient agrees that he or she feels cared for.

Caring Systems

Systems can't care about people, except, perhaps, in a Turing Test sense (that is, the system behaves indistinguishably from a human) although a person may perceive that the system does or does not care about their well-being. The patient may complain (or possibly praise) a smart healthcare system if the system was a human and capable of caring. But, setting aside this artificial intelligence sense of caring in a system, how does one incorporate the caring quality into a smart healthcare system and measure that quality?

While a system can't care about a human user -- or in the case of healthcare, a patient -- it may increase or decrease the "caring distance" between the caregiver (e.g. nurse) and patient [Figure 1]. The caring distance could be determined by some administration of Watson's WCPS or Nkongho's Caring Ability Inventory. For example, we can use one component of WCPS for the caring distance, or use all components and treat d as a vector.
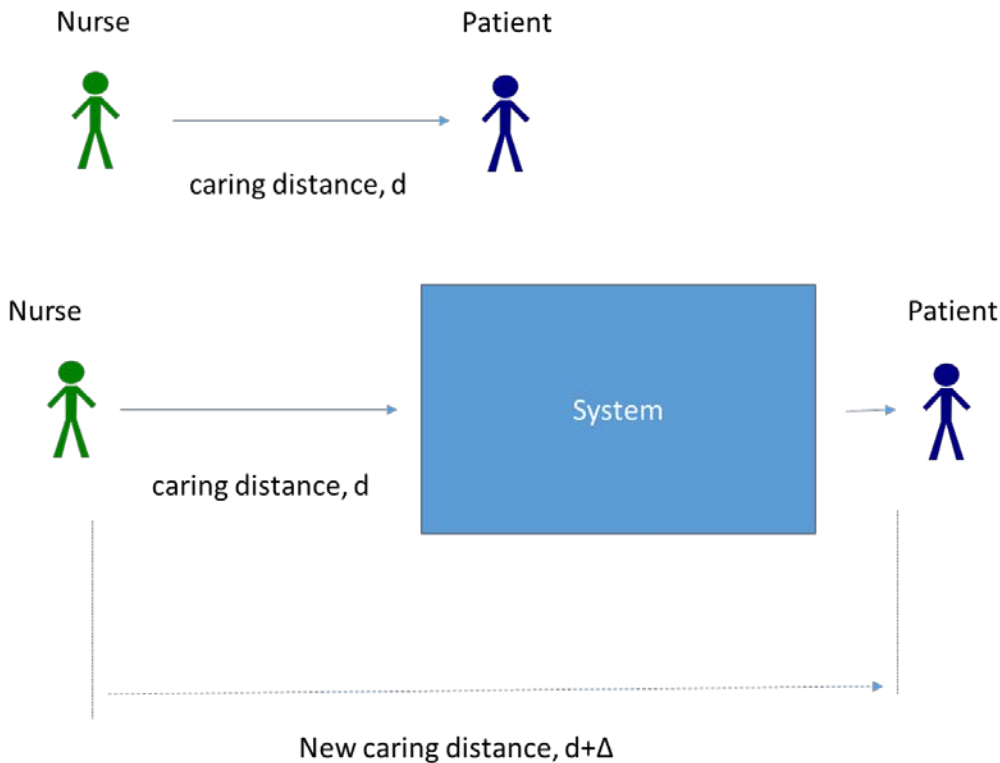
Figure 1. System increasing the caring distance between nurse and patient. The system is an IoT healthcare system.

We can estimate the change in caring distance through controlled studies of non-smart (e.g. local) versus smart (e.g., IoT-enabled) systems using Watson's WCPS or another metric.

We might assume that technology will increase the caring distance. It is possible, however, that caring may be estimated higher in a smart versus non-smart equivalent healthcare system. For example, as nurses become more aware of the benefits of technology to caring for patients, caring relationships may be enhanced with increased knowing. The comfort level of the nurse in using technology could also be a factor in the perception of caring, for all parties.

We expect that smart healthcare systems will have specific requirements for caring -- for example, to minimize the increase in caring distance to comply with some standard. Research to determine that standard minimum level of caring will also be needed.

For healthcare systems to continue to advance, technology must be an early and ongoing part of the conversation with stakeholders, and nurses in particular. Nurses lead the day-to-day care of a hospitalized patient, and they are, in most cases, the health care providers having the most patient contact. Technology can assist nurses in better patient care, but nurses must value and integrate these technologies and not see them as an impediment. Nurses must be involved early in requirements elicitation of smart healthcare systems to assure that the human connection is not compromised or lost.

The ility of caring shouldn't be limited to healthcare systems, in fact, it could be a desired quality to be optimized in virtually every system that interacts with humans, -- for example in smart transportation, smart homes and smart cities . Caring should also be an important consideration in systems that interact with certain non-human entities such as animals and the global environment.

Conclusions

Nurses often struggle with balancing technology and patient contact, since technology can remove the nurse from the direct contact with the patient. Conversely, technology has helped improve patient care by allowing for better assessment, surveillance, and treatment. With respect to smart healthcare systems, software and systems engineers need to have the same conversation while learning from the nursing profession before starting to build smart healthcare systems (whether they are based on IoT services and products or not).

The challenge in healthcare is to use "smart" technology to improve patient care while always preserving human contact. Caring is about relationships, those forged between patient/family/community and nurse. These relationships may manifest caring in different ways, and we need to recognize and acknowledge these differences.

Caring is an ility for smart healthcare systems that is complex, difficult to capture, and which subsumes many other important ilities and it deserves further study. But caring is so important that it must not be lost, and that is why we designate it a new super-ility for smart healthcare systems. Technology can augment the human touch, but not replace it.

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