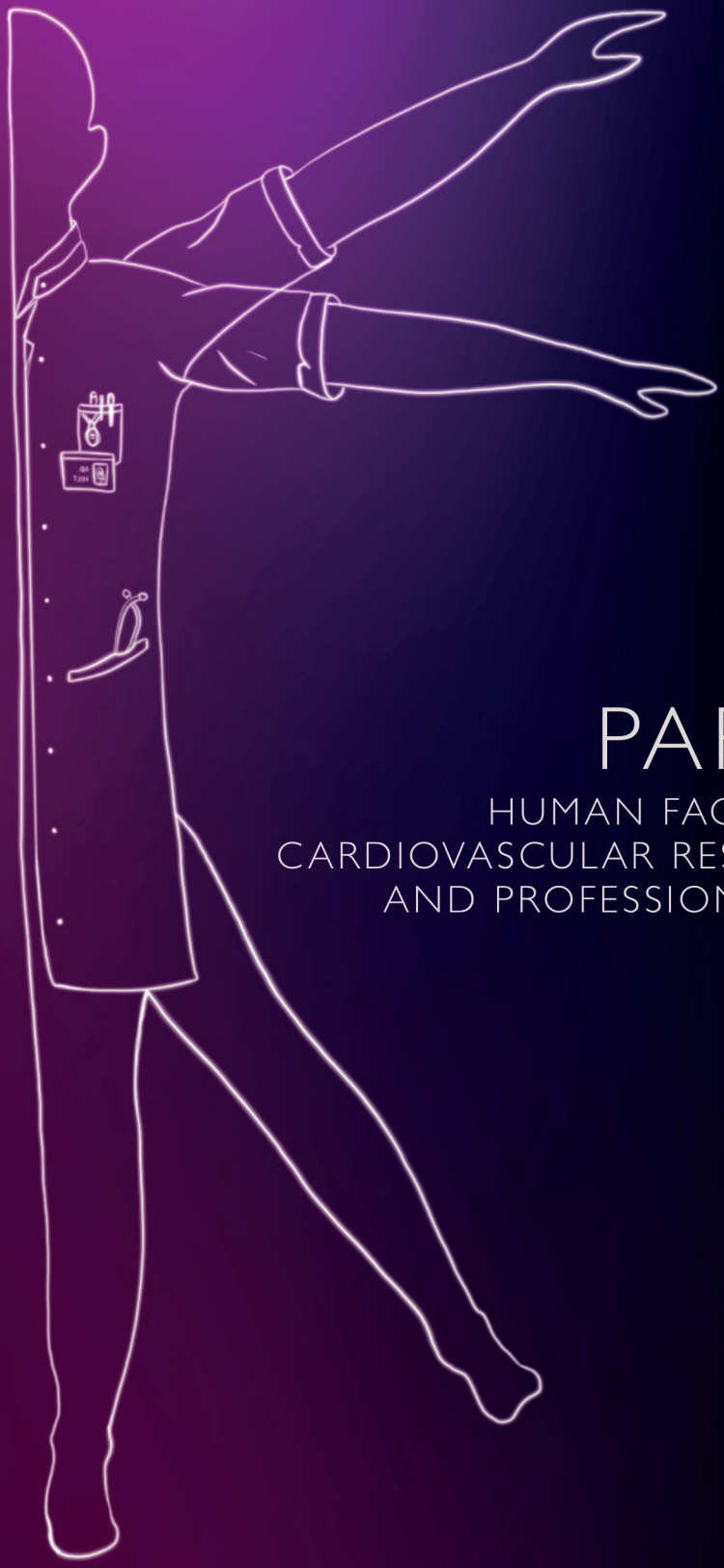
Redesigning cardiovascular healthcare: patient and professional perspectives on value

Hilt, A.D.



PART TWO

HUMAN FACTORS SCIENCE IN CARDIOVASCULAR RESEARCH - PATIENT AND PROFESSIONAL PERSPECTIVES OF CARE

CHAPTER IV

VALUE BASED HEALTHCARE IN CARDIAC CARE - THE ADDITIONAL VALUE OF HUMAN FACTORS SCIENCE

A.D. Hilt, MD; R.W.C. Scherptong, MD, PhD.

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Abstract

Developing patient-centered cardiovascular healthcare is eminent for an ever-growing, aging patient population. Value Based Healthcare (VBHC) research is becoming increasingly important in that matter, which questions the relevance (i.e. value) of contemporary evidence-based interventions in relation to *patients'* health status and personal preferences.

In cardiology, daily care consists of standardized complex care-tracks with diverse treatment options. The best possible care for a patient is based on contemporary scientific evidence and weighed by professionals. However, to assess the 'value' of care as perceived by the patient, is often difficult.

Human Factors (HF) science poses a useful addition in VBHC research. Via system analysis, such as combining observations and interviews into mapping a 'patient journey', it highlights the interaction between patient and professional both on *technical* and *non-technical* aspects of daily care. Value in that sense is uncovered by highlighting key points of interaction between patient and professional, with a focus on the patient experience and perspective.

This paper illustrates the added value of HF science into contemporary VBHC research in cardiology by discussing several example studies. It emphasizes the strength of it in determining value of care via a system analysis.

Introduction

Heart disease has a high mortality rate and morbidity burden worldwide, with the majority of total disease burden due to *coronary artery disease* (Kahn, 2020). Thankfully, survival of patients with coronary artery disease has increased since the second half of the 20th century (Fox et al., 2007).

The introduction of clinical electrocardiography by Willem Einthoven in 1901, the use of medication, cardiac surgery and percutaneous interventions have decreased mortality roughly from 50% in the 1950's, down to 2% in 2020 (O'Gara et al., 2013; Thygesen et al., 2012). Large randomized controlled clinical trials (RCT) and meta-analyses have been the hallmark of cardiovascular research to improve patients' health status (Lopes et al., 2019; Windecker et al., 2014). *Value* of care in that sense is determined through low mortality rates, fewer adverse events such as post-procedural bleeding, or medication-related side effects for example. Although important for patients' survival, this definition of *value* is rather one-dimensional in character, seen from the perspective of nowadays patients.

A 'bi-directional' focus on *value* in healthcare is embedded in the concept of 'Value Based Healthcare' (VBHC) which has become subject of growing interest in healthcare research (Porter, 2008; Porter et al., 2007). It incorporates the patient's perspective on determining value; it questions the need of certain evidence-based choices in relation to the relative benefit for the patient (Porter et al., 2007). In general, it attempts to transform care to become more 'patient-centered'. However, the complexity of cardiac care makes it difficult to determine what defines 'value' for patients.

Human Factors (HF) science, at the intersection of psychology, biology and engineering, poses an interesting field to shape VBHC research in cardiac care further. It combines qualitative and quantitative research methods like interviews, observations and questionnaires to gain perspective of patients within predefined care-tracks (Russ et al., 2013). Essentially, it helps to understand what defines 'value' from a patient perspective. In this paper, we discuss how HF science can contribute to the introduction and development of VBHC in cardiac care. To illustrate this novel approach, several example studies are discussed (Hilt, Kaptein, et al., 2020; Hilt, Mamaqi Kapllani, et al., 2020).

Value of Healthcare

The definition of "health" by The World Health Organization (WHO) in 1948 is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Three aspects of health are interchangeably linked; physical-, mental and social aspects of health(Huber et al., 2011).

First, physical health reflects the ability of individuals to maintain physiological homeostasis during changing conditions ("allostasis"), for instance an increase in heart rate while running. Illness develops when physiological mechanisms fail during harmful circumstances, such as blood clot formation during smoking, resulting in myocardial infarction. Second, mental health is the sense of how individuals coherently manage and adapt to changing circumstances to improve their subjective well-being. And last, social health projects both physical and mental health aspects in life in general; how does one manage life when there is interaction with other living objects and environments (Huber et al., 2011). Healthcare interventions, preventive or curative, have outcomes across all these aspects of health.

Outcomes, as stated by Porter, are multi-layered (Porter et al., 2007). The result of an intervention is not only 'dead or alive' (Tier 1) but also the occurrence of complications or return to daily life after clinical care (Tier 2) and the sustainability of health during life in general (Tier 3) (Porter et al., 2007). Healthcare professionals (both physicians andnon-physicians) define "value" of an outcome, in comparison to outcome as found in evidence-based studies. However, weighing outcome-tiers may differ between patient and professional.

Value Based Healthcare (VBHC) attempts to prioritize the patients' perspective of value by "the creation and operation of a health system that explicitly prioritizes health outcomes which matter to patients, relative to the cost of achieving this outcome" (Porter et al., 2004; Putera, 2017). Research in this domain questions the relevance of certain evidence-based interventions and outcomes with regard to patient-specific health aspects and personal preferences. A well-known example is a patient-reported outcome measure (PROM); patients are actively asked to fill out questionnaires, to reflect on received care after clinical admission (Wiering et al., 2017).

Questionnaires are, however, only developed for a single construct and rarely reflect all aspects of a care-track, let alone what a patient perceives as 'valuable'. The effect of interventions on outcomes in a care-track (i.e., performance) should be assessed from a broad system perspective in order to determine its value for patients.

Human Factors Science

HF science assesses human performance in complex systems for promoting safety and efficiency (Flin, 2009; Saleem et al., 2009). In healthcare, HF science is mainly applied for two purposes: i) reducing the cognitive and physical load of professionals and ii) promoting safe, efficient and high quality care to patients (Karsh et al., 2006; Saleem et al., 2009). To achieve both purposes, diverse research methods are used, for designing efficient, reliable and safe healthcare systems, supporting both professional and patient.

HF specialists and researchers gather data about human characteristics and human interaction with and within systems (Saleem et al., 2009). The strength of HF science lies in the combination of specialists from different disciplines, working together towards a common goal.

For example, in a previous study we assessed the dynamics of teamwork and team culture on safety during surgery, by applying HF questionnaires from the aviation industry in the surgical theatre (Hilt, Kaptein, et al., 2020). Identically, creating a patient-journey is often used by HF specialists to determine the experience a patient has in a care-track (Trebble et al., 2010), created by a combination of observations, interviews or questionnaires. Furthermore, this unravels the interaction with care, from a patient-perspective. These methods are in line with common VBHC research such as PROMs, but offer a broader scientific approach to assess system performance.

From Care-Track to Patient Journey – HF Science in Cardiac Care

In cardiology, there is a broad spectrum of treatments for diverse health conditions, such as acute myocardial infarction, heart failure or cardiac rhythm disorders. An example of determining value of care by applying HF research in VBHC in cardiology is to improve the care-track for myocardial infarction (MI) patients (Hilt, Mamaqi Kapllani, et al., 2020). The MISSION! program is a standardized care-track for MI-patients in a large tertiary hospital in the Netherlands (Liem et al., 2007).

It has three pillars of care: i) rapid transport of MI patients to a hospital for treatment, ii) four consecutive outpatient visits during 12 months to monitor cardiac function and intervene when needed and iii) secondary prevention of new cardiac events by promoting cardiac health with long-term treatment with multiple medications and lifestyle changes. Professionals educate patients on their disease, sharing extensive spoken and written information. The effectivity of information exchange is, however, subject of debate.

To investigate the process of information exchange and determine improvements for patients, we conducted an observational study in close collaboration with design engineers from the Faculty of Industrial Design Engineering of the Delft University of Technology. Patient journey mapping was used to assess how patients perceive patient information and education resources offered in the MISSION! Program.

Twelve patients were asked to elaborate on their experience within the MISSION! program, regarding education and information exchange during outpatient visits. Observations, interviews and questionnaires were used to map out the patient experience regarding information exchange.

It was found that, contrary to professionals' belief, information shared was regarded too extensive, technical and generic by patients (Hilt, Mamaqi Kapllani, et al., 2020). Most strikingly, medication, which is one of the hallmarks of secondary prevention in cardiology, was seen as a hurdle to recovery due to side-effects rather than a catalyst to good health. As a consequence, patients stated that they did not see added value of taking medication to improve their health. 'Health' was described as 'continuing my daily life' or 'be able to play with my dog again', and not primarily 'lowering my cholesterol or improving my heart condition'. In contrast, professionals stated that the amount of information shared was too little and that they wanted to teach more anatomical understanding and elaborate more on medication importance. This nicely illustrates the difference in perspective of how patients see their condition with an illness and what they define as important. Medication non-adherence is a common problem in the medical field, with side-effects and lack of information being frequent reasons (Naderi et al., 2012; Scott et al., 2003). The system approach as described above specifically highlights the mismatch between performance (extensive information shared), outcome (patients still lack information about medication) and value (professionals want to educate more, patients want less but more personal information). By focusing on the patient experience, it offers guidance on how to improve medication understanding and possible medication adherence in the MISSION care-track.

To overcome the above-described issue, the introduction of a mixed reality application has been proposed (figure 1). Ultimately, this application can be used to unite patients' and professionals' perspectives on medication education and foster interaction between both regarding this topic.

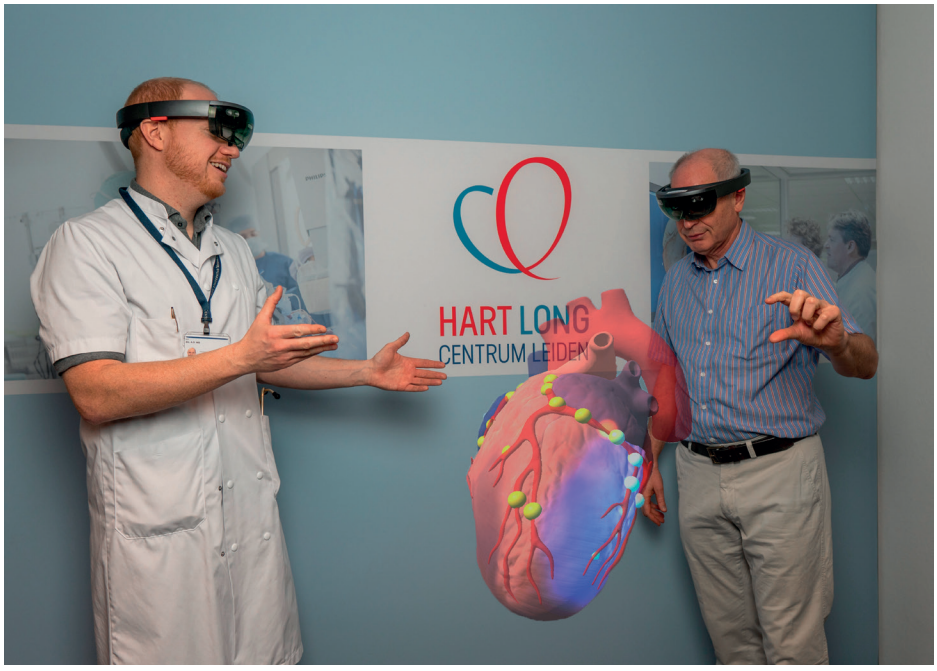

Figure 1. Example of a Mixed Reality application to understand medication after myocardial infarction.

Conclusion

The aforementioned HF approach can be applied to many topics in healthcare, not restricted to cardiology or to information exchange only. Nor is HF science restricted to understanding only patient-professional interaction, but professional – professional interaction as well. To alter healthcare in line with VBHC and shape care that prioritizes patients' perspectives and their value of care, HF science offers vital specialists and methods.

As a scientific discipline, it offers assessment of healthcare as a whole, in a constructive, multidimensional fashion. Ultimately shaping it to optimize performance, alter outcomes positively and create value for professional and patient in line with their preferences.

In our opinion, we would welcome a hybrid (academic) hospital, where medical professionals collaborate with human factors specialists on a daily basis. Healthcare professionals thus becoming aware of the possibilities HF science has to offer. VBHC in that sense, can be shaped continuously, with multidimensional input, from a 'concept', to a new 'standard of care'.

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