

# The Healthcare and Technology Synergy (HATS) Model for Practice and Research

Dr. Cynthia Chernecky<sup>1\*</sup>, PhD, RN, ACON, FAAN and Dr. Julie Zadinsky<sup>2</sup> PhD, RN

<sup>1</sup>Professor, Augusta University, College of Nursing, Augusta, GA, USA

<sup>2</sup>Assistant Dean for Research, Augusta University, College of Nursing, Augusta, GA, USA

## \*Corresponding author

Dr. Cynthia Chernecky, PhD, RN, ACON, FAAN, Professor, Augusta University, College of Nursing, Augusta, GA, USA, E-Mail: cchernecky@auguta.edu

Submitted: 30 May 2018; Accepted: 07 June 2018; Published: 14 June 2018

## Abstract

**Background:** Research models that include a focus on technologies or products are critical in today's healthcare environment. The Healthcare and Technology Synergy (HATS) model represents a synergy between three major variables, patient, product and practice, with each one affecting and being affected by the other. These variables exist within a total healthcare environment and are applicable to research in the professions of allied health, medicine and nursing.

**Problem:** To understand and review the use of the Healthcare and Technology Synergy (HATS) model in research and practice.

**Approach:** Models that include products can aid in evidence-based research that is translatable to patient care, patient outcomes and cost effectiveness.

**Outcome:** In the past 5 years, five countries (Australia, Canada, China, Ireland, United States) showed interest in the model, with 143 total views of the seminal article, and 5 research studies from medicine and nursing have used the HATS model.

**Conclusion:** Patient, product, and practice are of paramount importance in many areas of research such as bloodstream infections, urinary infections, ventilator assisted pneumonia, safety, and patient and product outcomes. Using the HATS model can strengthen research outcomes, aid in the prioritization of research agendas, establish evidence-based practice guidelines, and help in evaluating patient care outcomes.

**Keywords:** model, research, clinical, comparative effectiveness, practice

## Introduction

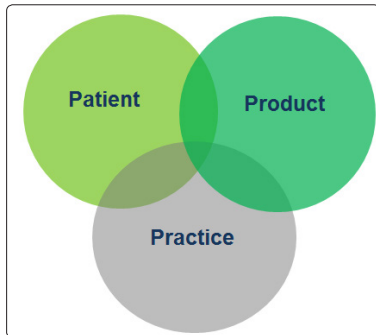
Research models that include a focus on technologies or products are critical for research and practice in current and future healthcare environments, but until now these models have not existed. In 2009, the Federal Coordinating Council for Comparative Effectiveness Research (CER) noted a heightened need to consider the impact of technology on clinical events, mortality and quality of life [1]. With the increased use of technology in healthcare, patients' reliance on technology for their longevity and quality of life, and frequent problems with multiple types of recalls, product has become a critical research variable. A newly created model, the Healthcare and Technology Synergy (HATS) model, includes three major variables: patient, product, and practice [2]. Other functional components of the model include health, environment, healthcare problem, healthcare personnel, industry personnel, and organizational design

(administration, governance, ethics). Structural components include assumptions that not all healthcare products are equal in design, function and/or outcomes and that the three main variables of the HATS model are interrelated. Concepts include technology (products and systems), care and maintenance of products and comparative effectiveness. The HATS model represents a synergy between the three major variables, with each one affecting and being affected by the other.

These variables exist within a total healthcare environment (e.g., preventive care, acute and chronic care, home care, rehabilitation, end-of-life) and need to be addressed for research studies, particularly those involving technology (e.g., infection control studies) or in which technology has a major influence (e.g., comparative effectiveness research (CER), the practices of allied health, nursing and medicine). An example of potential use of this model is implementation of CER pertaining to vascular access in oncology patients that will assist with the development of research priorities, best practice guidelines

for real world implementation, evaluation of academic curriculum development, and cost-benefit analysis.

In summary, the HATS model represents synergy between 3 major variables with each one affecting the other and being affected by the other. The model adds a more holistic and comprehensive approach to evidence-based practice research when translating findings to bedside care.



**Figure 1:** HATS Model

To aid in the understanding and application of this model, an example of the HATS model will be discussed in relation to the research area of vascular access. Examples of patient variables to consider include: demographics, comorbidities, therapeutic regimens, mental health status, finances, disease type and/or stage and living setting. Product variables may include three intravenous (IV) connector types/categories (positive = reflux with connection, negative = reflux with disconnection, zero = no reflux with connection or disconnection), peripherally inserted central catheters (PICC) categorized by number of lumens and power versus non-power usage, automatic blood pressure cuffs categorized on machine accuracy of pulse pressure and accuracy over time, antibiotic impregnated compared to non-antibiotic impregnated urinary catheters, and burn dressings impregnated with zinc versus silver ion technology. Practice variables may include the number of seconds you scrub the intravenous connector hub, how often vascular access dressings are changed, needle securement device versus no securement device used, how often an intravenous connector is changed, nurse-patient ratios, specialized vascular access team versus no team, and vascular access supply availability.

### **Problem**

The purposes of this review were twofold: to understand a new clinical research and practice model that focuses on patient, product and practice determinants of health within multiple complex systems, and to review the use of the Healthcare and Technology Synergy (HATS) model in research and practice and its applicability to diverse populations across the lifespan.

### **Approach**

Models for research are needed that include the variable of technology/product to aid in evidence-based research that is translatable to patient care, affects patient outcomes and is cost effective.

### **Outcome**

Publication of the seminal article on the HATS model in 2013 has generated global interest in the model and its use within nursing and medical research and practice. Five countries showed interest in the

model, with 143 total views combined nationally (United States) and internationally (Australia, Canada, China, Ireland). To date a total of 5 research studies have used the HATS model. Two publications cited the HATS model as a research framework in medicine including the reduction of central line-associated bloodstream infections (CLABSI) outside the ICU [3] and a bundle approach to reducing infections in hematologic patients [4]. Three publications used the HATS model including a nursing practice project as part of the Doctoral Programs in Nursing (DNP) curriculum [5], for assessments [6] and in practice [7]. Examples of poster and podium presentations by this article's authors have referenced the HATS model when highlighting the importance of technology in research and practice [8, 9] as have other nursing authors [10] commenting on its timeliness and usefulness in research.

### **Conclusion**

The HATS model has generated significant interest and use in research and practice in both nursing and medicine. With a focus on the three variables of patient, product, and practice, the HATS model is applicable to diverse populations across the lifespan. Alone or in combination, these variables are significant determinants of health within multiple complex systems. Patient, product, and practice are of paramount importance in many areas of research such as bloodstream infections, urinary infections, ventilator assisted pneumonia, safety, and patient and product outcomes. This model will assist in theoretical development of the disciplines and practices of allied health, medicine, nursing and science.

### **Implications**

The HATS model is useful to researchers and clinicians in allied health, medicine and nursing globally in today's product-dependent healthcare environment, where it is important to determine comparative effectiveness of products for the purposes of diminishing poor healthcare outcomes and controlling costs. The HATS model is ideal for use in multi-site research involving nursing and medical assessments of manufacturers' products as well as bundles of care and their influence on patient outcomes. The model's major variables (patient, product, practice) correspond to reality and provide a blueprint for research, education and practice. The model can aid in the research for reliable interventions based on study findings and the framework for developing worldwide compatible and comparable nursing and healthcare interventions when products/technologies are used in healthcare. Using the HATS model can strengthen research outcomes, aid in the prioritization of research agendas, establish evidence-based practice guidelines, and help in evaluating patient care outcomes.

### **References**

1. Federal Coordinating Council for Comparative Effectiveness Research. Report to the President and Congress. Washington, DC: Department of Health and Human Services, June 2009. Accessed December 2015, at <http://www.hhs.gov/irrecovery/programs>
2. Chernecky C, Zadinsky J, Macklin D, Maeve M K (2013) The healthcare and technology synergy (HATS) model for comparative effectiveness research as part of evidence based practice in vascular access. *Journal of the Association of Vascular Access* 18: 169-174. <http://dx.doi.org/10.1016/j.java.2013.05.001>
3. Dumyati G, Concannon C, van Wijngaarden E, Love T M T, Graman P, et al. (2014) Sustained reduction of central line-

- 
- associated bloodstream infections outside the intensive care unit with a multimodal intervention focusing on central line maintenance. *American Journal of Infection Control* 42: 723-730. <http://dx.doi.org/10.1016/j.ajic.2014.03.353>
4. Martinez M, Leite J, Franca D, Capela R, Viterbo L, et al. (2015) Conjunto de medidas adotadas para reduzir infecções sistêmicas no doente hematológico em neutropenia com cateter venoso central de longa duração | [Bundle approach to reduce bloodstream infections in neutropenic hematologic patients with a long-term central venous catheter]. *Acta Medica Portuguesa* 28: 474- 479. Retrieved from <http://www.actamedicaportuguesa.com/>
  5. Humphrey J S (2015) Improving registered nurses' knowledge of evidence-based practice guidelines to decrease the incidence of central line-associated bloodstream infections: An educational intervention. *Journal of the Association of Vascular Access* 20: 143-149. <http://dx.doi.org/10.1016/j.java.2015.05.003>
  6. Chernecky C, Macklin D, & Blackburn P (2015) Catheter-related bloodstream infections (CR-BSI) in geriatric patients in intensive care units. *Critical Care Nursing Quarterly* 38: 280- 292. doi:10.1097/CNQ.0000000000000076
  7. Macklin D, & Blackburn P L (2015) Central venous catheter securement: Using the healthcare and technology synergy model to take a closer look. *Journal of the Association of Vascular Access* 20: 45-50. doi:10.1016/j.java.2014.10.011
  8. Chernecky C, Macklin D, Blackburn P (2013) Use of the HATS framework in connector research. Poster. 8<sup>th</sup> Annual GAVeCeLT (Gli Accessi Venosi Centrali a Lungo Termine), Turin, Italy, December 5-7, 2013.
  9. Chernecky C, Zadinsky J, Macklin D, Maeve MK (2013) The significant variable missing in oncology research and education is technology. Poster, Oncology Nursing Society Congress, Washington DC, April 25-28, 2013.
  10. Rosenkoetter M M (2016) Overview and summary: Organizational outcomes for providers and patients. *The Online Journal of Issues in Nursing* 21: 1.

**Copyright:** ©2018 Cynthia Chernecky. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.