SIMUL8 Healthcare Whitepaper

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Using Simulation to Train Health Care Team Members:

Population Health and Value Based Contracting

Population Health and Training Summary

The evolving landscape in U.S. health care reimbursement and care delivery models is a challenge for practitioners in the current environment. A common barrier to the shift from a fee-for-service model to a value-based revenue model is the re-engineering of the care delivery model [1]. Training health care practitioners to understand new concepts of population health medicine in a dynamic and constrained workplace environment is key to future success for organizations and the individual practitioners. This redesign includes a multi-disciplinary team of providers who address the needs of patients across multiple settings and includes the range of health needs from preventive health to long term condition management and acute issues [2].

Adults present distinct challenges to any educational or training program. Several principles of adult learning include:

1. Understanding why a training event is important
2. Problem solving is a motivator for learning
3. The experiences of the participants must be respected
4. The educational approach should match their background and diverse perspectives
5. Interaction is a key aspect of the learning process [3]

The situational context here forms the basis for a training event designed to solve the challenge of practitioner training in population health management. A SIMUL8 simulation was created to model the epidemiological underpinnings of a population. Specifically, the population segment associated with Diabetes Mellitus (DM) was identified as the target group for the simulation. A gaming concept was integrated into the simulation training to address the challenges of adult learners, specifically health care practitioners in an academic medical center.

About the Author

Dr. Philip Smeltzer is currently responsible for health improvement activities and strategies for patient populations served by MUSC Health through both inpatient and ambulatory care in the Charleston, South Carolina region.

Previously Philip was a Managing Consultant, Employer Solutions at Optum for five years. There Philip evaluated health promotion and health management programs for primarily Fortune 100 clients. Philip has also served as the Vice President, Health Care Quality Improvement HealthNow NY in upstate New York. He worked in the managed care arena in a variety of roles including quality improvement, informatics, health promotion and disease management for 12 years.

Philip was responsible for the design, development and implementation of the preventive care and wellness programs at Humana for four years. Dr. Smeltzer has also worked as an Associate Director with the Wellness Institute of Buffalo an advocacy agency.

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Simulation Overview

The training exercise includes concepts of team training, adult learning principles, in a simulation/gaming environment with real-world based outcomes or deliverables that allow participants to gain practical knowledge for immediate application. A key aspect of the training is an emphasis on a team approach. This team concept is integrated into the exercise and should be considered for participants as they consider future treatment options. The resources available in the simulation and outcomes are based on empirical research and intended to mimic outcomes in an applied setting. Participants are segregated into teams of 3-5 per group.

The intent of the simulation and gaming process is to mimic the intervention and decision making in a population to obtain the greatest number of engaged patients who improve their lifestyle habits and adhere to care plans. The allocation of resources drives participation or lowers erosion from participation. The optimum allocation of resources will drive up participation. The number of patients who complete lifestyle program participation or improve adherence in care plans will accumulate savings. The greater the number of patients who make it through the simulation, the greater the accumulated savings each team garners. The teams reach decisions of allocating a limited amount of resources in the simulation. The available resources for allocation in the simulation are outlined in the table. $1million in staffing and an additional $500,000 for communications and analytics are available for each team to allocate in each simulation round.

Basic Infrastructure

- Communication Resources
- Information Technology and Analytic Resources

Staffing Resources

- Patient Navigators
- Health Coaches, Certified Diabetic Educators (CDEs)
- Registered Nurses, Certified Case Managers
- Doctors of Pharmacy (PharmD)
- Certified Social Workers (CSW)
- Physicians, Nurse Practitioners, Physician Assistants

Patient Capacity per Resource Per Round (simulated year)

Role	Capacity per Round	Resource per Unit
Patient Navigator Contacts	2, 800	$60,000
Health Coaches, CDEs, PharmDs, CSWs – patient load	175-200	$70,000
Registered Nurses, Certified Case Managers – patient load	50-75	$90,000
Physicians, Nurse Practitioners, Physician Assistants - visits	2,500	$175,000
Communications and Analytics (total available)		**$500,000**

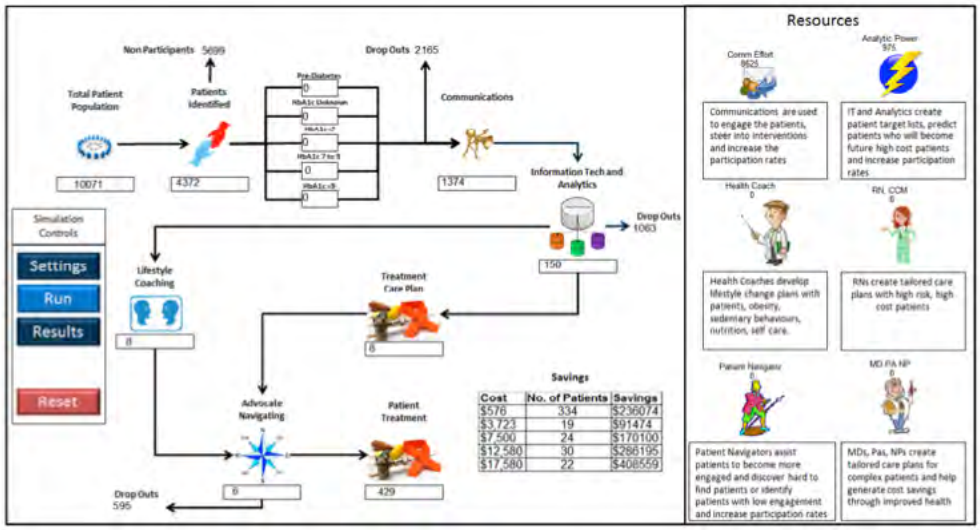
Total Patient Population

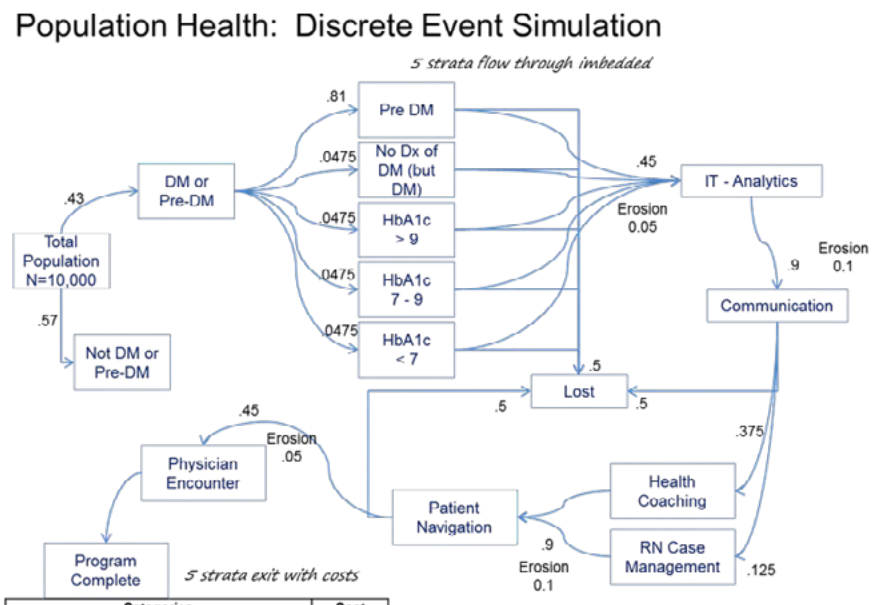
10,000 patients start the simulation as the total population. Patients will proceed through various stages of interaction with clinical resources and be targeted for interventions. The patients are identified and stratified into one of six categories in the simulation.

- ✓ Non Participants
- ✓ Pre Diabetes
- ✓ Diabetes diagnosis with HbA1c unknown
- ✓ Diabetes HbA1c level < 7%
- ✓ Diabetes HbA1c level 7% to 9%
- ✓ Diabetes HbA1c level greater than 9%

Stratification Categories	Percent Allocation	Number of Patients	Annual diabetes cost – Etiological Fraction
Non Participants	57%	5,700	Baseline 0 additional
Pre Diabetes	35%	3,500	$576
Diabetes diagnosis with HbA1c unknown	2%	200	$3,723
Diabetes HbA1c level < 7%	2%	200	$7,500
Diabetes HbA1c level 7% to 9%	2%	200	$12,580
Diabetes HbA1c level greater than 9%	2%	200	$17,580

The model depicted assumes the optimum resource allocation. When the resource allocation in the simulation is less than optimum, the ratio of patients who erode increases. The actual SIMUL8 simulation screen is displayed here.





Categories	Cost
Pre Diabetes	$576
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A discrete event simulation (DES) was selected as the probabilistic approach to develop the patient flow and cost outcomes. The DES approach was selected over a Markov model due to the complexity of variables interacting in the simulation and the integration of time as a consideration. The patients flow through the model simulating the natural progression and regression of diabetes. The segmentation of the population proceeds along multiple paths and not as discrete cohorts more typical of a Markov model [5]. The SIMUL8 simulation follows the general progression and model variables from start to finish as depicted in the table here.

The patient population interacts with various staff resources as the SIMUL8 simulation executes. The decisions and resource allocation drive the participation rates. Patients will drop out or erode for a variety of reasons in the simulation, just as in real life. Several times in the simulation the number of patients participating is reduced (lost) by 50% [6]. The erosion of the patient population is based on previous empirical research and implementation research [4, 7, 8]. The patients remaining in each category will migrate to a degraded health status in the next round. Patients who completed all engagements (program) in a round will migrate to an improved health status in the next round.

Example: Patients in the strata with HbA1c 7-9% who complete the program will begin the next round in the HbA1c <7% category. Conversely, patients who erode and do not complete the program will migrate to a higher cost category, the HbA1c >9% strata.

The resources influence the participation. At the end of the simulation cost savings (7%) will be applied against the number of patients who have completed the program and effectively changed behavior. These are projected annual savings. When a population is managed in an attempt to maximize health with limited resources a series of outcomes are documented. The population health resource allocation will change the performance of the simulation at several points. The allocation of communication and IT/Analytic resources influence the number of patients initially available for program engagement. The program is not a discrete finite intervention but a continuous set of interactions with the health care team.

The optimum mix of personnel resources in the simulation drives the maximum number of participants. The range of successful completions who exit the simulation ranges between 250-475 patients, dependent on resource allocations. Savings generated at the end of each round range between $650,000 and $1.2 million from an expense pool of approximately $18 million.

The training effect for participants occurs during the intra-team discussion on resource allocations prior to each simulation round decision point. The intended result of this discussion and the posting of results for all teams are to produce a gaming environment. The feedback from participants has validated this effect. Physician participants reported that the simulation demonstrates what they perceived to be a conceptual strategy to integrate allied health professionals. A typical comment reported was, ***"this game scenario brings the team approach to life – I get it now."*** The application of population health management principles within the simulation and gaming scenario improves the participant experience and satisfaction. The retention of key learning principles such as the promotion of a multi-disciplinary approach in a patient centric manner appears to be successful. The appreciation of health management program execution such as the loss of a majority of patients along a path of engagement was also reported to have been retained by participants.

The use of a simulation model to mimic patient engagement in a population health scenario appears practical. Establishing a gaming environment with team competition for participants improves the training experience and retention of new insights obtained through the training. The concept of integrating a SIMUL8 simulation with patients associated with diabetes and a gaming environment has the potential to be modified for lifestyle issues or other long term conditions with respective epidemiological patterns and etiological cost fractions.

References

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