



## Research Residents' perceptions of skill decay: Effects of repeated skills assessments and scenario difficulty



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### ARTICLE INFO

#### Article history:

Received 1 July 2016

Received in revised form

8 December 2016

Accepted 9 December 2016

#### Keywords:

Skill decay

Education

Resident

Simulation

Confidence

Self-efficacy

### ABSTRACT

**Introduction:** Skills decay is a known risk for surgical residents who have dedicated research time. We hypothesize that simulation-based assessments will reveal significant differences in perceived skill decay when assessing a variety of clinical scenarios in a longitudinal fashion.

**Methods:** Residents (N = 46; Returning: n = 16, New: n = 30) completed four simulated procedures: urinary catheterization, central line, bowel anastomosis, and laparoscopic ventral hernia repair. Perception surveys were administered pre- and post-simulation.

**Results:** Perceptions of skill decay and task difficulty were similar for both groups across three procedures pre- and post-simulation. Due to a simulation modification, new residents were more confident in urinary catheterization than returning residents ( $F(1,4) = 11.44, p = 0.002$ ).

In addition, when assessing expectations for skill reduction, returning residents perceived greater skill reduction upon reassessment when compared to first time residents ( $t(35) = 2.37, p = 0.023$ ).

**Conclusion:** Research residents may benefit from longitudinal skills assessments and a wider variety of simulation scenarios during their research years.

**Table of contents summary:** As part of a longitudinal study, we assessed research residents' confidence, perceptions of task difficulty and surgical skill reduction. Residents completed surveys pre- and post-experience with four simulated procedures: urinary catheterization, subclavian central line insertion, bowel anastomosis, and laparoscopic ventral hernia repair. Returning residents perceived greater skill reduction upon reassessment when compared to residents participating for the first time. In addition, modification of the clinical scenarios affected perceptions of skills decay.

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## 1. Introduction

Approximately 40% of residents in general surgery training programs across the United States participate in dedicated research fellowships during their second and third years of residency.<sup>1</sup> During this time, clinical responsibilities reduce drastically. This reduction allows residents' surgical skills and clinical knowledge to become vulnerable. Research studies relating to residents' time-away have largely focused on resident motivations for conducting

research<sup>2,3</sup> and the potential financial burden surgical departments face with increase length of training<sup>1</sup> when residents take time away from clinical training. There is a paucity of studies regarding resident perception or self-assessment of skill decay in a simulated setting.

As residents transition from clinical rotations to dedicated research, those skills that were recently introduced for the first time or are still being introduced are more vulnerable to decay. Skills susceptible to decay are influenced by time away from the task, previous level of knowledge obtained, type of training methods, and task characteristics.<sup>4</sup> While residents recognize that their skills change during their research period, it is still unclear how these concerns relate to specific procedures or levels of difficulty within a task or procedure. For example, a resident may feel

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quite confident performing an appendectomy in a thin patient but have much lower confidence in a patient with a BMI of fifty or a pregnant patient with appendicitis.

As part of a longitudinal study, we have assessed resident confidence, perceptions of task difficulty and surgical skill reduction during time away from the clinical setting. Our goal is to understand how resident perceptions of skill decay relate to perceptions of task difficulty and confidence as they progress through dedicated research. In the first year of the study, residents had varying perceptions of skill reduction for specific surgical and bedside procedures.<sup>5</sup> This finding helped us to show that there is variation in perceived decay across procedures. Now that we are in the second year of the study, and residents who participated in the first year have returned for reassessment, we now have an opportunity to see if their perceptions have changed over time. In addition, we can compare the perception of these returning residents with a new cohort of residents being assessed for the very first time. We hypothesize that simulation-based assessments will reveal significant differences in perceived skill decay when assessing a variety of clinical scenarios in a longitudinal fashion.

## 2. Methods

### 2.1. Setting and participants

Data collections occurred annually between May and September at seven sites across four Midwestern states. Participants were residents (post graduate year [PGY] 2–5) engaging in dedicated research in general surgery training programs. The analyses address two consecutive years of data collections. In the first year, 38 research residents participated. In the second year, 46 residents participated. Sixteen of the 38 original residents (42%) returned for a second year of data collection, designated as ‘returning residents.’ Thirty additional residents participated for the first time, designated as ‘new residents.’ The University of Wisconsin Institutional Review Board approved this study.

### 2.2. Surveys

#### 2.2.1. General survey

Prior to performing four simulated procedures, residents completed a demographic survey that included questions on PGY level and time spent in dedicated research. Residents also reported their perceived reduction in global clinical and surgical skills and procedure specific skills including: urinary catheterization, subclavian central line insertion, bowel anastomosis, and laparoscopic ventral hernia (LVH) repair. The survey questions on skill reduction were cast on a 5-point Likert scale (1 = No reduction; 3 = Moderate Reduction; 5 = Very large reduction).

#### 2.2.2. Procedure-specific survey

Residents also completed a survey on their confidence and perceived difficulty of completing specific surgical procedures and individual tasks prior to completing the four simulations: subclavian central line insertion, bowel anastomosis, urinary catheterization and LVH repair. Residents reported on their confidence and perceived difficulty using 5-point Likert scales (1 = Not confident or Not difficult; 5 = Extremely confident or Extremely difficult, respectively). Following each procedure, as part of the pre- and post-research design, residents completed the surveys again, indicating their confidence and perceived difficulty. The questions on both surveys were identical.

### 2.3. Simulated procedures

After completing the pre-simulation survey, residents completed four simulated clinical procedures: urinary catheterization, subclavian central line insertion, bowel anastomosis, and laparoscopic ventral hernia (LVH) repair. Residents were provided with clinical scenarios and the necessary equipment to complete each procedure successfully. To standardize station times, residents completed three urinary catheterization scenarios and one scenario for each remaining procedure. For the bowel anastomosis and LVH repair procedures, residents were also provided with a trained researcher that acted as a surgical assistant.

The simulation scenarios were developed using cognitive task analysis<sup>6–8</sup> and expert review. Commercial urinary models were purchased from a simulation company (Central LineMan System, Simulab Corp, Seattle, WA). The LVH models were developed in-house and purchased from a fabrication company (Busy Bee Enterprises, Sacramento, CA). Simulated bowel was purchased from a local butcher shop (Underground Butcher, Madison, WI) or acquired from the veterinary school (University of Wisconsin-Madison, School of Veterinary Medicine). Modification of the commercial simulators and development of the simulated scenarios is detailed in the reporting of the first year findings.<sup>5</sup> Each procedure represented different levels of task complexity and decision-making. The urinary catheterization scenarios were developed to represent complex patients, and the LVH repair scenario was truncated to mesh securing and tacking steps so that all residents could participate and potentially succeed in completing the task.

### 2.4. Data analysis

Demographic variables were totaled and resident responses to the pre- and post-surveys were averaged to evaluate changes in perceived skill reduction, confidence, and perceived task difficulty. Means were evaluated using repeated measures analysis of variance (ANOVA) and paired t-tests in IBM SPSS Statistics Version 23 (IBM Corp, Armonk, NY). The goal was to assess differences in skill reduction, confidence, and perceived task difficulty when comparing returning residents with first time residents.

## 3. Results

### 3.1. Demographics

Forty-six residents (38.3% female; PGY 2–5) participated in the second year of the study. There were 30 new residents (42.4% female; PGY 2–5) that participated for the first time and 16 returning residents (30.8% female; PGY 2–4) from the first year that returned for reassessment.

New residents completed 2.6 clinical years on average (SD = 0.86). At the time of data collection, new residents had spent an average of 6.54 months away from clinical duties (SD = 8.21) and planned to spend another 15.9 months on average (SD = 8.7) in the laboratory. All new residents (100%) planned to spend the next year in research.

Returning residents completed 3.3 clinical years on average (SD = 0.79). At the time of data collection, returning residents spent an average of 14.2 months away from clinical duties (SD = 9.46) and planned to spend another 6 months on average (SD = 5.85) in the laboratory. Of the residents who completed the study twice, 10 residents (62.5%) participated in the first year of the study upon entering the research lab. The 10 residents participated in the second year of the study after one year away from clinical duties and therefore planned to spend the next year partaking in

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