



Bingo as a Novel Approach to Skill Building in the Initial Months of Surgical Internship: A Pilot Implementation

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Abstract

Introduction: We have observed inconsistencies in residents' experiences regarding important procedures and tasks necessary for patient care. We aimed to improve individual motivation to learn and become facile with specific practices earlier in the timeline of the internship years.

Methods: Intern Bingo was implemented in a single general surgery residency. Two sites, both tertiary care centers with institutional practices, were utilized. Twenty-four procedures/tasks important to clinical practice were identified, including but not limited to Nasogastric Tube placement, IV insertion, incision and drainage, laceration repair, vascular doppler exam, and clinical documentation. Bingo cards were randomly generated. To assess comprehension, interns taught back necessary components to a senior resident or attending to complete each bingo square; including indications, supplies, steps, troubleshooting techniques, and complications. First, the residents were awarded prizes to complete a row and a full card (a cloth scrub cap and portable pulse-oximeter, respectively). A Likert-scale survey assessing satisfaction was administered following the completion of the internship period.

Results: The first row was completed in two weeks and the first full card at four weeks. All participants finished the cards within 8 weeks. 54% of the participants returned the survey and 100% reported positive experiences. 50% felt that bingo created a healthy learning environment with improved teaching, and the remaining 50% were neutral. 75% reported that Bingo positively influenced decisions to seek out opportunities. 100% conveyed a desire to repeat Bingo as mentors. Feedback from the attendings was gathered, with positive assessments of the interns' skills and confidence.

Conclusion: Bingo is a simple and easily implemented educational tool that works to alleviate variations in experience early in the internship period. It represents a novel and effective way to motivate the interns to learn important procedures and tasks within the first two months of residency. Cards may be effortlessly tailored to a variety of residency programs and rotations.

Keywords: Surgery, Internship, Residency, Teaching, Procedure

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Introduction

It has long been established that variability in education, baseline knowledge, and experience is high in first-year residents starting surgical training (1-3). As the pool of diversity increases among the incoming residents, so does the diversity in foundational skillsets. Furthermore, more pronounced heterogeneity was observed following the onset of the COVID-19 pandemic, probably because of clerkship restructuring to accommodate social distancing restrictions (4). These identified inconsistencies are often with respect to important procedures and tasks necessary for patient care. One year before project implementation, the interns who had entered our residency program were anonymously surveyed concerning common procedures such as nasogastric tube placement, peripheral intravenous line insertion, abscess drainage, drain removal, chest tube placement, and others. Wide variations were noted which ranged from residents with significant exposure and experience to common responsibilities to those who had never performed the tasks independently or observed them.

A variety of approaches to standardizing education and experience level have emerged in the last two decades including 'summer school' programs hosted at the medical school level as well as 'surgical boot camps' held by surgical residencies for incoming interns (5, 6). Our approach to standardization includes the use of Bingo cards, specifically a simple method to track accomplishments while generating interest at the individual level. We conducted a study where residents were given the opportunity to engage in an educational activity which promoted success by harnessing the power of internal motivation, teamwork, and healthy competition through reward and task-based strategies. We aimed to improve each individual's enthusiasm to learn and become facile with specific practices earlier in the timeline of the internship years in order to improve exposure and knowledge base.

Methods

Intern Bingo was implemented in a single general surgery residency. Two independent sites were utilized, both tertiary care centers with institutional practices where residents rotated on general surgery and trauma services. A total of eleven residents completing their initial post-graduate-year (PGY) participated over a two-year period. During the first year, Bingo was used where five interns were rotating on the general surgery and trauma surgery services. Six interns were rotating during the second year Bingo was

used. Incoming residents represented a wide array of medical schools including United States Allopathic [7], Caribbean [1], and International institutions [3]. Heterogeneity was observed in both genders (Male=6, Female=5), contract status (Categorical=5, Preliminary=6), and age distribution (25-31 years, average 28.5).

Twenty-four procedures and tasks important to clinical practice, specifically in our general surgery residency, were identified, including but not limited to Nasogastric Tube (NGT) and Foley catheter (FC) placement, peripheral intravenous (PIV) line insertion, incision and drainage (I&D), laceration repair, vascular doppler exam, and admission/discharge documentation. These procedures and tasks were specifically selected and tailed for hospital site and surgical service. Full complement of general surgery rotation tasks (Figure 1) and trauma surgery tasks (Figure 2) can be seen in Bingo card format. The classic free center square was maintained. Bingo cards were generated at random using a free online website to ensure fairness in distribution of the squares (7). The tasks were proctored by a senior resident to confirm the interns' accomplishment. In order to assess comprehension upon completing a square, interns taught back necessary components to a senior resident or attending to complete each bingo square, including indications, supplies, steps, troubleshooting techniques, and complications. Senior residents utilized institutional standards for each component to ensure foundational knowledge. If these components could not be verbalized, the resident was provided with additional education and remediated. First, they were awarded prizes to complete a row and a full card (a cloth scrub cap and portable pulse-oximeter, respectively).

Time to completion was noted for both the first Bingo row, first complete card, and total time for all residents to finish their cards. A voluntary, anonymous survey was administered following completion of the program for which no compensation was provided. Using a Likert-Scale structure (Strongly Agree, Agree, Neutral, Disagree, or Strongly Disagree) outcomes including overall perception of the program and its influence on the first eight weeks of learning. Responses in each Likert category were totaled for each question in order to review the residents' perception of the program and desire to continue utilizing it as an educational resource. Written responses were reviewed to obtain qualitative data regarding the participants' reflections on the program. Free-text written commentary was also elicited from attending physicians regarding their observations of the program. Institutional Review Board standards did not require approval.

General Surgery Intern Bingo				
Place NGT	Place PIV	Complete a Discharge	Complete an Admission	Write a Brief Op Note
Run Wed SW Rounds	Place a Foley	Draw Labs	Complete a Consult	Replete Labs
Find the Blood Bank	Place a Wound VAC	★	Remove a Drain	Perform an I&D
Call a Consult	Perform a Rectal Exam	Consent a Patient	Perform a Lac Repair	Use a Doppler
Assist a Lap Chole	Debride a Wound	Assist a Lap Appy	Teach a Patient IS	Run the List

Figure 1: Bingo Card for General Surgery Rotation. Tasks tailored to hospital specific General Surgery Rotation. {Nasogastric Tube (NGT), Peripheral Intravenous Line (PIV), Operative (Op), Social Work (SW), Laboratory Studies (Labs), Incision and Drainage (I&D), Laceration (Lac), Laparoscopic (Lap), Incentive Spirometry (IS)}.

Trauma Surgery Intern Bingo				
Place NGT	Place PIV	Complete a Discharge	Complete an Admission	Write a Brief Op Note
Participate in a Trauma	Place a Foley	Draw Labs	Report Incidental Findings to a Patient	Replete Labs
Clear a Cervical collar	Place a Wound VAC	★	Remove a Drain	Perform an I&D
Call a Consult	Perform a Rectal Exam	Respond to a Code	Perform a Lac Repair	Use a Doppler
Use an Ultrasound	Debride a Wound	Get Prescription Access	Teach a Patient IS	Run the List

Figure 2: Bingo Card for Trauma Surgery Rotation. Tasks tailored to hospital specific trauma rotation. {Nasogastric Tube (NGT), Peripheral Intravenous Line (PIV), Operative (Op), Incision and Drainage (I&D), Laceration (Lac), Incentive Spirometry (IS)}.

Results

A diverse population participated in the program (n=11). While 64% of the residents were graduates of U.S. Allopathic medical schools, twenty-seven percent (27%) were international medical graduates and an additional nine percent (9%) Caribbean alumni. Categorical residents comprised forty-five (45%) participants. Self-reported gender was noted with fifty-five percent (55%) male and forty-five (45%) female. All first-year residents from two subsequent years (n=11) completed their Bingo cards. Notably, the first Bingo row was completed within two weeks. The first full card was accomplished in four weeks. All residents finished their cards within the first eight weeks of residency.

At the conclusion of their internship year, all residents were surveyed with a response rate of fifty-four percent for a total of 6 respondents. All respondents completed all of the survey questions (Table 1). When the overall experience with the program was examined, all the residents reported positive outcomes (Strongly Agree=4, Agree=2). We further delineated opinions prior to starting the program and upon completion. Sixty-seven percent of all respondents conveyed a positive attitude prior to starting the program. Notably, those individuals who initially remained neutral regarding the program demonstrated positive opinions after finishing the experience and an increase of eighty-three percent satisfaction rate. Remarkably, no negative attitudes were submitted regarding the impact of Bingo on the first eight weeks of the internship period (eighty-three percent (83%) positive opinions). Similarly, when we inquired about learning and performance of the tasks, eighty-three percent of the residents surveyed felt the program exerted a positive impact on their experience. The remaining seventeen percent of residents remained neutral with respect to these metrics.

Residents were further surveyed concerning

the learning environment and teaching from senior residents during their time completing the program. Overall performance of the program was positive, with eighty-three percent of the interns reporting a healthy atmosphere and fifty percent feeling an improvement in senior residents’ involvement. In a positive note, no resident felt the program was detracted from learning or teaching by seniors. The majority of them (83%) indicated Bingo positively influenced their decisions to seek out learning opportunities. Finally, when inquiring regarding interest in continuing the program, all the residents stated they would like to repeat the intern Bingo in the coming academic years as mentors.

As to qualitative reporting, one resident stated, “Bingo was very useful to me ... it was a great way to be motivated to learn new procedures in a more efficient manner. By doing so, I learned to do these procedures sooner, but I also learned how the hospital worked, such as knowing where the labs would go where they were drawn or where the blood bank was. Learning the nuances ... allowed me to take care of patients more efficiently when things needed to be expedited. Lastly, they did not like a little bit of healthy competition among co-residents.” Qualitative feedback was also gathered from the general surgery residency program attendings. One representative response included, “The first time I heard about the intern bingo, I thought it was a joke, or a waste of time. I looked at it from biased eyes; those were skills that were supposed to be obtained early in medical school. It was by seeing the intern class competing to fill their cards that I realized the knowledge and skill gaps students leave medical school with. Bingo not only brought up competitive personalities, but a cooperative effort among the interns and senior residents to help each other and make sure everyone was up to par. Bingo is a clever way to assess the knowledge and skill gaps, and correct

Table 1: Resident Survey Responses

Survey Question Theme	No. (%) (n=6)					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	*Overall Positive Experience
Overall Positive Experience	0	0	0	2 (33.3)	4 (66.7)	6 (100)
Positive Opinion PRIOR to Starting Program	0	1 (16.7)	1 (16.7)	3 (50)	1 (16.7)	4 (66.7)
Positive Opinion AFTER Completing Program	0	1 (16.7)	0	3 (50)	2 (33.3)	5 (83.3)
Positive Impact on First 8 Weeks	0	0	1 (16.7)	1 (16.7)	4 (66.7)	5 (83.3)
Positive Impact on Learning	0	0	1 (16.7)	1 (16.7)	4 (66.7)	5 (83.3)
Positive Impact on Performance	0	0	1 (16.7)	1 (16.7)	4 (66.7)	5 (83.3)
Created a Healthy Learning Environment	0	0	1 (16.7)	1 (16.7)	4 (66.7)	5 (83.3)
Improved Teaching by Seniors	0	0	3 (50)	2 (33.3)	1 (16.7)	3 (50)
Influenced Seeking Opportunities	0	1 (16.7)	0	3 (50)	2 (33.3)	5 (83.3)
Interested in Continuing Program	0	0	0	2 (33.3)	4 (66.7)	6 (100)

*Aggregate responses in Agree and Strongly Agree Column (No. (%))

them in a nurturing, educational, and collaborate way” (Figures 1, 2).

Discussion

Bingo represents a simple and easily implemented educational tool which works to address variations in experience at the start of the first year in residency. Furthermore, it works to alleviate disparities in exposure early in the internship period by reducing the timeline to education and completion of clinical skills. It is a novel and effective way to motivate the residents to learn important procedures and tasks within the first two months of residency.

It is well established in the educational community that adult learning styles differ significantly from those employed in adolescence (8-10). Studies have demonstrated that reward and task-based learning is common within adult learners (11-13). As a result of these qualities, we felt a competitive task-driven activity would produce positive outcomes and experiences for first-year residents. By igniting personal inspiration to achieve and offering external incentives as stimuli, we capitalized on these traits.

Various programs have been developed to address heterogeneity in the baseline knowledge and skills of incoming first-year residents. These include ‘summer school’ curricula for graduating medical students as well as residency-specific surgical “boot camps” for incoming interns (14-17). While these programs demonstrate excellent outcomes in both learner satisfaction and quality in teaching, they may not foster opportunities to apply practical knowledge and skills to real-life scenarios. Moreover, intensive short-term training sessions do not address the ranges in the timeline observed for each resident to successfully learn and execute important benchmarks for clinical care.

While our results are promising, it is prudent to acknowledge the limitation of a single-center pilot study with only two years of data collection. This resulted in a relatively small sample size though heterogeneity was preserved in the population. More robust data may be gathered via multi-institutional implementation. Additionally, the survey data were collected posthumously, including the residents’ opinion of the program before starting, raising concern for potential recall bias. Furthermore, while all survey administration was anonymous, the small cohort size could influence the residents’ comfort with anonymity and result in an untoward influence on responses. Ideally, pre-implementation survey analysis would have been performed on each cohort of interns to adequately assess skill levels before completion of the program. Moreover,

work is being completed to generate validated comprehension assessment checklists for senior residents to be utilized during the verbal teach-back sessions, which were not undertaken during the pilot implementation. Expanded investigation is anticipated to better delineate the effectiveness of Bingo cards as teaching tools, including quantitative assessment of the potential for determining ease versus difficulty of completion for each square. This could precipitate focused education for residents of those tasks/procedures which were found to be universally challenging.

Conclusion

The Bingo program can be effortlessly tailored and implemented in any hospital and residency program with simple adjustments of procedures and tasks to account for institutional requirements. Larger residency programs with subspecialty rotations may adjust Bingo card squares to account for important benchmarks germane to each specialty. Additional investigation is warranted to determine the efficacy of Bingo as a complementary program when offered in conjunction with surgical boot camp, as well as used during the core clerkship rotations in medical schools.

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Authors’ Contribution

Project design was completed by D.L. Project implementation and execution was facilitated by D.L and M.W. Project analysis and manuscript creation was completed by D.L and S.G.

Conflict of Interest

The authors declare no conflicts of interest.

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