Improving Clinical Handovers: An Interdisciplinary Undergraduate Teaching Scheme

M. Ha, J. French, Lister Hospital, East & North Hertfordshire NHS Trust, United Kingdom
Z. Ahmed, University of Hertfordshire, United Kingdom

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Abstract
In 2007 the World Health Organisation highlighted the dangers of poor communication within handovers in the clinical safety and continuity of care of patients worldwide. Many of these handovers occur between doctors and nurses who receive little formal training in this skill during their undergraduate degrees, with few derived from education theory and almost none delivered via interdisciplinary means. As the COVID pandemic has drawn final year medical and nursing students into the workforce, effective evidence-based teaching of this topic is needed now more than ever. The authors developed a case-based interactive teaching session based on Kolb's Learning cycle and a Constructivist paradigm, using simulation practices to develop the students' clinical skills. The sections of the session were mapped onto two further pedagogical theories: Gagne's Event of Interaction and Pillars of Handover Education. Three pilot sessions were completed by 18 medical and nursing students, with pre- and post-questionnaires used to assess their confidence and ability to formulate coherent handovers. Statistically significant improvements were seen in all criteria assessed, with students demonstrating particular improvements in better understanding the wishes and capabilities of the other specialty during a handover (Δ=5.2, $p < 0.0001$), and confidence in knowing what information to best provide (Δ=3.8, $p < 0.0001$). A drop in the perceived barriers to providing a handover, and the associated anxiety that can result, was also observed (Δ=-3.5, $p < 0.0001$). The implementation of this pilot scheme of interdisciplinary teaching sessions allowed student doctors and nurses to gain practice and confidence in their ability to escalate and handover appropriately between disciplines- a vital skill in the face of the COVID pandemic- with candidates showing immediate improvement.

Keywords: Medical Education, Educational Theory, Teaching & Learning, Undergraduate, Interdisciplinary, Clinical Handovers, Handoffs, Multidisciplinary

Introduction

During the early hours of a night shift, there is a common fear shared between newly qualified nurses and doctors alike. That is, the acutely deteriorating patient, and their need for escalation. Though much anxiety may surround the management of this clinical scenario, many health professionals report apprehension in the process of the phone call itself required to handover a patient (Lundin et al, 2018). This can be true of either the nurse making the call, or of the doctor receiving it. One solution to this concern has been to provide teaching within the degrees of the respective professions, but although the field of medicine is largely a multidisciplinary one, very little interdisciplinary work is seen within the undergraduate curriculum (Gordon, Hill, Stojan & Daniel, 2018). In both the institutions involved in this research, the University of Cambridge and the University of Hertfordshire, neither provide any formal teaching sessions which incorporate students from both courses. Despite this, they are expected to work together from their first day of work.

Interventions in communications and effective handovers have been proven to provide cost-effective improvements in the attitudes, skills and knowledge of professionals (Gordon et al., 2018). Though few have stemmed from a basis in evidence-based pedagogy and educational theory, there is now a growing body of literature in the subject (Gordon, Grafton-Clarke, & Hill, 2019).

In order to address these concerns, the authors created and piloted an interdisciplinary two-hour lesson on communication in effective handover and escalation. This session was designed for four student doctors and four student nurses to follow a case-based interactive teaching session based on Kolb's Learning cycle. It drew its learning from a Constructivist paradigm and used simulation practices to develop their clinical skills. In these initial sessions, the goal was not necessarily to achieve perfect handovers, but to understand and practice a structure that could be relied on to underpin a handover in difficult and stressful scenarios.

Background

Clinical handover can be described as the transfer of professional responsibility from one person to another. This may be between professional groups, and either temporary or permanent (Blyth, Bost, & Shiels, 2017). The effective implementation of this is crucial for patient safety and the accurate transfer of clinical information, in both the escalation of deteriorating patients, and the exchange of ward-based responsibilities during a shift change. It facilitates multidisciplinary collaboration, as well as providing safe and competent long-term care to the patient (Gordon et al., 2018). The World Health Organisation in 2007 highlighted the dangers of poor communication in handovers in the clinical safety and continuity of care of patients around the world. Miscommunications and omission of vital information have led to poorer clinical outcomes, longer stays in hospital and worse patient experiences (World Health Organisation, 2007). It has thus been implemented to be a part of their High 5s Project that was launched to address the greatest worldwide concerns to patient safety (World Health Organisation, 2013).

This problem has been further exacerbated by the implementation of the European Working Time Directive (EWTD), which has led to an increased number of shifts in a

typical week for both doctors and nurses. This has resulted in a greater number of handovers each week, greater disruption to continuity, and a greater chance of poorer handovers, leading to poorer patient outcomes (Maybury, 2014).

The risk of providing poor handovers is not confined to any one professional role, and it is thus a shared responsibility for the whole clinical team (Doyle & Cruickshank, 2012). Though there are many opportunities to develop these skills whilst on the job these are often ad hoc, unstructured, and may lack a more experienced team member to provide guidance. It could be argued that a more effective approach to improve the quality of handovers is by implementing structured teaching during the undergraduate curriculum (Gordon & Findley, 2011).

Clenland, Ross, Miller and Patey (2009) highlighted the need for this in the medical profession, with many junior doctors feel underprepared in the effective handover of critically ill patients. They identified five key themes that factor into this anxiety: definition of handover; experience of handover as a junior doctor; perceptions of junior doctors' handover skills and attitudes; systems factors and their interaction with individual factors; and the 'what' and the 'how' of teaching handover.

As for nursing students, handover and communication skills are often expected to be picked up informally during rotational experiences, and there is often little formal teaching regarding the quality of content within the handover itself (Lally, 2001). This leads to a disparity between how well nurses are trained in handovers by the time of graduation, and is largely dependent on opportunity.

Methods

Intervention Design & Pedagogical Theory Used

Our intervention design was guided by key studies and based on relevant educational theory, in particular utilising Kolb's Learning Cycle (as outlined in Appendix 1) and a Constructivist approach.

Based on a systematic review by Gordon et al. in 2018, it was concluded that educational interventions in handover are best placed to occur in a practical, work-based setting, where the benefits of the skills learnt can be immediately understood.

Few medical professionals experience undergraduate teaching sessions with other clinical professionals, especially in teaching sessions that focus on the interaction between specialties, as opposed to providing shared teaching of common topics (Gordon et al, 2018). This is an oversight we sought to address with our intervention.

The style of learning utilised for our intervention was based on the pedagogical theory of Constructivism (Ertmer & Newby, 2013)- a style in which the learner constructs knowledge based on past experiences, and is considered more effective for complex, ill-defined concepts, such as those often faced in the practice of medicine (Jonassen, 1991). This style was also noted to be considered more effective in the context of andragogy- the learning methods specifically utilised for adult learners. As outlined by Knowles, Holton and Swanson (2012), adults possess qualities that influence their capacity to learn, including being problem solvers, independent learners, having

greater experience, and motivation as an internal process. They argue these traits require a more Constructivist approach to teaching.

When considering the application of this to teaching handover and communications, it was concluded that a Constructivist approach would be to utilise students' experiences and implement critical reflection to draw out useful learning points. This application of focused reflection or 'directionality' has been demonstrated to allow for more personalised and impactful learning experiences (Dewey, 1986), and was achieved during the session via the self-reflective model of Kolb's Learning Cycle (Kolb, 1984). In the design of our teaching intervention, we mapped each step of the cycle to a task or objective to facilitate the teaching of handover theory and technique (Figure 1, Appendix 1).

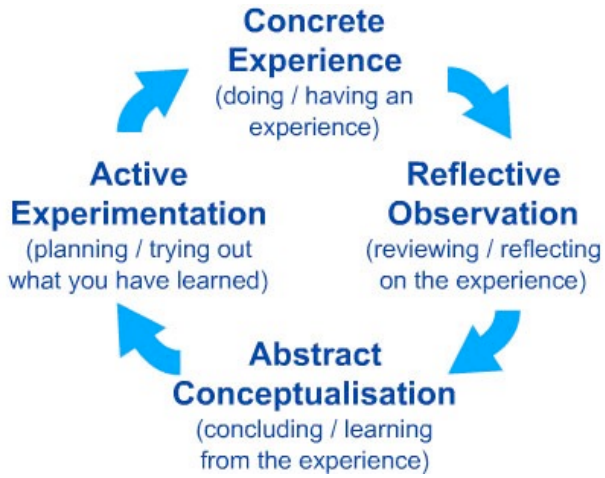


Figure 1: "The Experiential Learning Cycle" (McLeod, 2017)

The session was designed to begin with Reflective Observation to provide the initial experiences and material for the lesson, before moving on to Abstract Conceptualisation where conclusions could be teased out from these experiences, guided by a facilitator. The facilitator subsequently linked these conclusions into a discussion of the SBAR approach to handovers, and its relevance or potential drawbacks in the suggested scenarios (Shahid & Thomas, 2018).

The latter half of the teaching session was designed to take a more practical, providing the students the chance to solidify these skills in practice through discussion and Active Experimentation. To complete this cycle, Concrete Experiences were generated by using faster, simulation-style examples, allowing students to practice real cases in pairs, with feedback provided by the remaining observing students and the facilitator.

Finally, a potential issue to address was that of multiple distinct group identities (Tajfel, Billig, Bundy & Flament, 1971) resulting in an 'In-group' and an 'Out-group'. This is a relatively common problem within the NHS between different professional groups, and could have hindered the interdisciplinary nature of our intervention. As such, it was addressed by mixing groups throughout the session to remove the 'In-/Out-group' mentality, offsetting this concern.

Data & Statistical Analysis

Our graph was plotted as mean values ± standard deviation (SD) using GraphPad Prism 8, with which statistical analysis was also performed. Significance stars were calculated using paired, two-tailed Student's *t*-tests, with statistical significance demonstrated as follows: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, ****$p < 0.0001$.

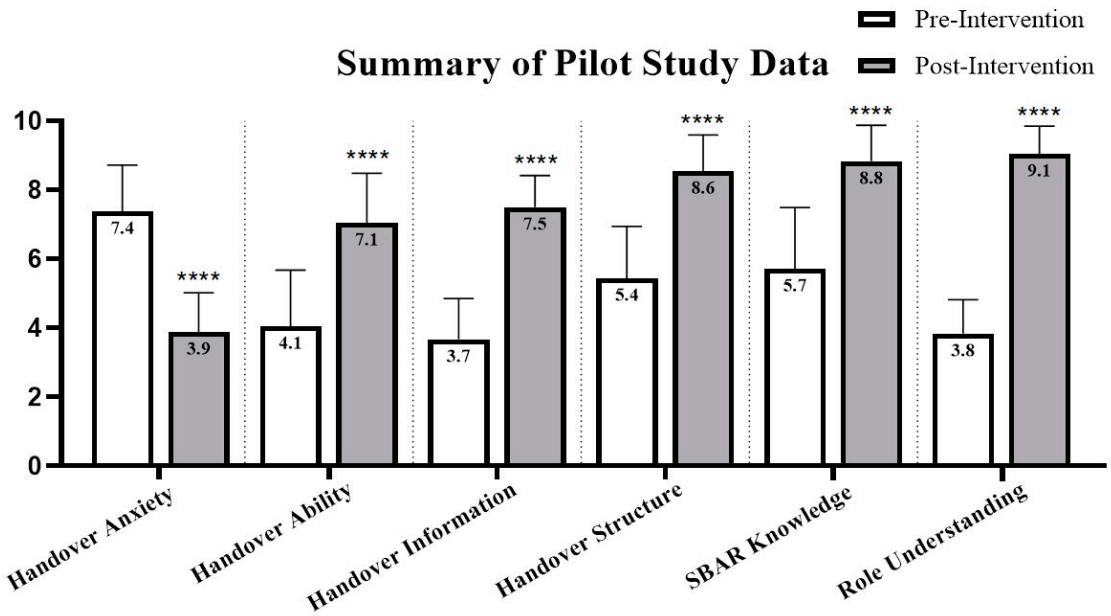
Results

10 Nursing students and 8 Medical Students participated in these pilot sessions, and all 18 completed the pre- and post-session questionnaires. Statistically significant improvements were seen in all criteria assessed (Table 1), with students demonstrating particular improvements in better understanding the wishes and capabilities of the other specialty during a handover ($\Delta=5.2$, $p < 0.0001$), and confidence in knowing what information to best provide ($\Delta=3.8$, $p < 0.0001$). A drop in the perceived barriers to providing a handover, and the associated anxiety that can result, was also observed ($\Delta=-3.5$, $p < 0.0001$).

	Pre-Intervention Mean	**Post-Intervention Mean**	**Mean of Differences**	**Standard Deviation of Differences**	**95% Confidence Intervals**	**p-value**
How well do you understand the exact responsibilities and abilities of the other **job roles** in this teaching session?	3.8	9.1	5.2	0.73	4.86 – 5.59	<0.0001
How confident are you in your knowledge of **SBAR**, and how to use it?	5.7	8.8	3.1	2.42	1.91 – 4.32	<0.0001
How confident are you in your ability to **structure** a handover?	5.4	8.6	3.1	1.75	2.24 – 3.98	<0.0001
How confident are you in knowing what **information** to put in a handover?	3.7	7.5	3.8	0.92	3.37 – 4.29	<0.0001
How confident are you in your **ability** to do a clinical handover?	4.1	7.1	3.0	1.28	2.36 – 3.64	<0.0001
How **anxious** are you to make a clinical handover of an unwell patient out-of-hours?	7.4	3.9	-3.5	1.47	-4.23 – -2.77	<0.0001

Table 1: Pre- and Post-Intervention Questionnaire Results

Additionally, all 18 students stated that they would recommend this teaching session to colleagues, giving very kind and positive feedback.



Graph 1: Summary of Pre- and Post-Intervention Results

Discussion & Limitations

The cornerstone of this teaching session was in the practical use of Kolb's learning cycle, in a Constructivist manner, to guide the development of effective communication of handovers. Its benefits are clear as it removes the hierarchical nature of a classroom, engages the student in a more active learning role, and utilises all participants in the session (Fenwick, 2005; Reynolds, 2009). Nonetheless, it is not without its criticisms and challenges. Both the students and authors encountered several difficulties with this method, bringing into focus some of the limitations of our session.

In order to begin the session with Reflective Observation, there is a reliance on the students providing experiences to draw from. Unfortunately, this was comparatively lacking in the medical students- few were able to recall, and appropriately discuss, examples of handovers, either good or bad. This was exaggerated by the contrast with the nursing students, who demonstrated far greater practical experience, potentially stemming from their greater amount of clinical observation (Lally, 2001). This reliance on the baseline knowledge and engagement of the students towards the beginning of our session highlighted a potential issue- if little is volunteered from the participants, a very stilted session can result and may lead to a difficult split between open dialogue and resorting back to didactic teaching methods. The facilitator is meant to manage these discrepancies through appropriately providing comments and directing questions to others within the group. However, this approach shifts the reliance onto the facilitators developing their own expertise in enabling experiential learning, without simply imposing their own experiential learning points on the students as often occurs (Tomkins & Ulus, 2016).

In contrast, the disparity in experience between the students was reversed in Abstract Conceptualisation, in which the medical students had comparatively more experience with identifying and applying learning points to subsequent scenarios after the initial scenario has already been discussed. These discrepancies highlight the challenges of providing a shared, multidisciplinary teaching session to groups of students whose undergraduate courses take very different approaches and focus on different learning styles.

These difficulties were further encountered during Active Experimentation, in which many of the students found it difficult to assimilate a large quantity of auditory information while cases were verbally discussed or 'handed-over' to them. This likely represents the different learning styles preferred by the students, whether they be visual, written or kinesthetic information (Fleming, 2001)- in particular many nursing students often show kinesthetic learning traits (James, D'Amore, & Thomas, 2011). However, given that in practice most handovers are provided verbally this hurdle was necessary to improve the students' skills in receiving handovers. During our pilot sessions a discussion was integrated focusing on how best to articulate auditory information to those who struggle with receiving it, as well as which key points of information are important to listen for when receiving a verbal handover. This discussion will need to be further refined and incorporated into our future sessions.

During this stage, several students also demonstrated notable resistance to the act of simulating handovers. A potential source of this anxiety to engage with experimentation may stem from minimal interpersonal rapport built between the students, which can be difficult to create within a short space of time. This alludes to a wider problem seen within small group teaching, especially that of a mixed background; the balance between creating an environment that is conducive to learning, and the provision of the learning itself. Gagne's Events of Instruction (Gagne, 1985) provide an approach to better address this- the introduction of an 'icebreaker' activity within the 'Gaining Attention' phase could have facilitated questioning and interaction throughout the rest of the lesson (Chlup & Collins, 2010). This may have helped resolve some of the apprehension seen by the students to engage with the later stage of "Eliciting Performance". To improve future teaching sessions the remainder of Gagne's Event of Instruction, which can provide a clear pathway for sessions specifically aimed to develop practical skills within adult learners, were considered and mapped onto the outline of our session (Table 2).

In addressing further ways to refine our teaching session, the three "Pillars of Handover Education" (Darbyshire, Gordon, and Baker, 2013) that lead to effective handover education were also considered, and again mapped to our session- a summary of both theories applied to our work can be seen in the table below (Table 2). Retaining our application of Kolb's Learning Cycle as a basis of the session, we can implement the 'Responsibility and Accountability' pillar within the 'Reflective Observation' phase, where the students can discuss experiences of errors or poor handovers to highlight the professional responsibility each of us have. The 'Information Management' pillar is comprehensively covered during the 'Abstract Conceptualisation' and 'Active Experimentation' stages of roleplaying scenarios, and finally an understanding of 'Systems to Facilitate Handover' is addressed in 'Concrete Experience' of practice in the workplace, and the checklists or mnemonics that be utilised.

Kolb's Learning Cycle	Interdisciplinary Teaching Section	Gagne's Events of Instruction	Pillars of Handover Education
Reflective Observation	Open Discussion of the roles of nurses and doctors	(1) Gaining Attention (2) Informing learner of objectives (3) Stimulating recall of prior learning	Responsibility and Accountability
Abstract Conceptualisation	Review of the information required for handovers	(4) Presenting stimulus (5) Providing learning guidance	Information Management
Active Experimentation	Group work within disciplines of working through cases	(6) Eliciting performance (7) Providing feedback (8) Assessing performance	Information Management
Concrete Experience	Practice examples between disciplines of telephone handovers	(6) Eliciting performance (7) Providing feedback (8) Assessing performance (9) Enhancing retention and transfer	Systems to Facilitate Handover

Table 2: A Comparative Mapping of Educational Theories to the Interdisciplinary Communication Teaching

A final limitation to be discussed is the sample of participating students. Our sample size of 18 students represents a small proportion of the total healthcare student body our session is designed for, and this must be taken into account when drawing conclusions. Furthermore, while the medical students were recruited from an existing cohort of random students regularly supervised by the lead author (and so are relatively representative of the medical student body), the nursing students were recruited via an email asking for volunteers to 'opt in' to the teaching session. This approach naturally self-selected students who were more likely to engage with the session, and so this may not necessarily be representative of the cohort as a whole.

Despite its limitations, the importance of our study became evident during the latter half of the teaching sessions, where the relative inexperience of many students across both disciplines with utilising the SBAR handover tool was apparent, potentially through either poor understanding or infrequent use. While most of the students knew of the SBAR acronym, many failed to appropriately prioritise the information needed in each section, leading to them getting 'lost' in the SBAR tool and rambling through the categories, producing ineffective handovers. This was ultimately addressed successfully within out teaching sessions, emphasising the benefits of our intervention, the need for additional teaching in this area of clinical practice, and the importance of further work in this field.

Such work could include investigating whether the improvements seen in our sessions translated to empirical improvements in real clinical settings, whether such improvements positively impacted on patient safety, and whether skills gained during our sessions declined over time or were integrated into the participating students' long-term clinical practice, all with a greater sample size.

Conclusion

What this pilot study demonstrates is the first application of Kolb's Learning Cycle to an interdisciplinary teaching program in a district general hospital, with immediate benefits seen in self-reported confidence, knowledge and skills of undergraduate students.

Limitations affecting this pilot study included the voluntary nature of the session, producing an inherent selection bias towards students attending who were more likely to engage with the session, and the limited number of participants. Furthermore, as the data collection was limited to confidence and self-assessment, it highlights the need for more extensive assessment tools in these areas.

Regardless of this, we can learn from the obstacles faced during this initial set of teaching sessions to refine our intervention, and begin to extrapolate a potential multi-session program of repeated cycles to further guide our students to more effective handovers, improved patient safety, and more synergistic workings between professional disciplines.

In light of the COVID-19 pandemic, a safe and robust interdisciplinary clinical team is needed now more than ever. As we continue to build on this work, expanding our sample size and including more thorough assessments of both knowledge and practical abilities, we must be mindful of the requirements of social distancing and the difficulties this may bring to a session designed specifically for in-person interactions. Contingencies will need to be in place as we prepare to roll out this program to the 50 interim foundation doctors and 50 extended placement nursing students within our trust, but as the nation eases its lockdown we must be prepared to take steps towards shaping the new face of in-person clinical teaching.

Appendix 1: Lesson Plan Format

Course: Cambridge Uni Medicine MBBChir & Uni of Hertfordshire Nursing BSc
Lecturer: [*Anonymised*]
Topic: Interdisciplinary Communication Teaching
Venue: Lister Hospital **Time:** 13.30-15.30
Number of Students: 4 Nursing Final Years + 4 Medical Final Years

Aim	To improve the handover and escalation communications seen between different disciplines, more specifically, between nurses and doctors

Learning Outcomes (objectives)	**a)** Understand and appreciate the shared and separate roles of doctors and nurses within healthcare	**b)** Appreciate the importance of effective handover and escalation calls, and what information should be prioritised
By the end of the session the students will be able to:	**c**) Work through example cases preparing what should be mentioned in a handover	**d)** Practice handing over between nursing and medical students

Time	**Outcomes / Objectives Reference**	**Teacher Activity**	**Resources**	**Assessment Method**	**Mapping of Kolb's Learning Cycle**
13:30	a) b)	Intro & pre-questionnaire	Phones (Google Form)	Questionnaire	
13:45	a)	Open discussion of the roles of nurses & doctors	Phones (Mentimeter)		Reflective Observation
13:55	b)	Review of the information required for handovers	Computer/ Projector		Abstract Conceptualisation
14:15	c)	Group work within disciplines of working through cases	Cases		Active Experimentation
14:30	d)	Practice examples between disciplines of telephone	Hospital Phone	OSCE-style observation	Concrete Experience

		handovers			
15:15	a) b)	Feedback & post-questionnaire	Phones (Google Form)	Questionnaire	

Appendix 2: Pre- and Post-Intervention Questionnaire

Student No: **Date:**

How well do you understand the exact responsibilities and abilities of the other **job roles** in this teaching session?

Not at all

1	2	3	4	5	6	7	8	9	10

Extremely well

How confident are you in your knowledge of **SBAR**, and how to use it?

Not at all

1	2	3	4	5	6	7	8	9	10

Extremely good

How confident are you in your ability to **structure** a handover?

Not at all

1	2	3	4	5	6	7	8	9	10

Extremely good

How confident are you in knowing what **information** to put in a handover?

Not at all

1	2	3	4	5	6	7	8	9	10

Extremely good

How confident are you in your **ability** to do a clinical handover?

Not at all

1	2	3	4	5	6	7	8	9	10

Extremely good

How **anxious** are you to make a clinical handover of an unwell patient out-of-hours?

Not at all *Extremely*

1	2	3	4	5	6	7	8	9	10

anxious

Would you recommend this teaching session to your colleagues? (Please circle)

Yes *No*

Any further comments/feedback:

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Contact email: m.ha@nhs.net