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STUDENT NURSES, INCREASING PLACEMENT CAPACITY AND PATIENT SAFETY. A RETROSPECTIVE COHORT STUDY.

Abstract

One solution to the global nursing shortage is to increase the numbers of student nurses: clinical placements need to increase their capacity to host them. Capacity increases have previously been viewed as problematic if they increase the supervisory burden on registered nurses, and unsafe if they dilute students' supervision. The aim of this study was to assess the impact on specific patient safety measures (pressure ulcers, falls and medications errors) of having students in placement being educated in Collaborative Learning in Practice (which increases capacity) compared to when they were not. Audit data were collected from four NHS trusts in the South West of England in a retrospective cohort study. We received data on 5532 adverse events from 15 clinical areas in four NHS trusts, with 996 students on placement between January 2018 and August 2019. The risk ratio and mean differences for adverse patient events were favourable (RR=0.9842; 95%CI 0.9604-1.008; mean difference 279, 95%CI 213-346, p=0.01). There was no statistically significant correlation between increased student numbers and increased adverse patient events. Our data must be interpreted with caution, but we conclude that increasing capacity for student nurses in placements appears to have a positive impact on patient safety.

Keywords

Student nurses; patient safety; cohort study.

Highlights

- We examined the impact of increasing student numbers in placement
- We used adverse patient events: falls, pressure ulcers and medications errors

Increasing student numbers in placement reduces the risk of adverse patient events

- There was a statistically significant impact
- Increasing student numbers appears not to be unsafe

Background

The United Kingdom (UK), in common with most countries, is experiencing a crisis in nurse staffing at a time when populations are ageing and demand for skilled nursing is increasing (Buchan et al., 2019; World Health Organisation, 2011). Laying aside the issue of how to retain staff, which requires urgent action (Darbyshire et al., 2019), one 'supply side' solution is to increase the numbers of student nurses beginning their education, and this approach has been advocated across the globe. In the USA, greater partnership working between education institutions and clinical practice areas has been tried (Burns et al., 2011); in Australia, fostering collaboration between university and placements to develop a new preceptorship model is reported as being successful (Barnett et al., 2010); in Japan targeted career planning for school leavers is advocated (Jung, 2020). Other solutions to increase the numbers of registered nurses (RNs) include recruitment drives by more developed nations in less developed ones (Nelson, 2004; Ross et al., 2005); and in particular subsets of a population such as ethnic groups (Healey, 2013), or males (Feng et al., 2016). At all times there has been relentless pressure on nurse 'skill mix': substituting graduate nurses for those with lesser educational preparation, who take less time to qualify and are cheaper to prepare than graduates (Needleman, 2017). The number of RNs in a clinical setting is crucial to patient morbidity and mortality (Aiken et al., 2014; Zhu et al., 2012); one international estimate indicating that even a 1% increase in nurse staffing would decrease mortality (Amiri and Solankallio-Vahteri, 2019). A shortage of nurses on shift leads to missed care (Dabney and Kalisch, 2015; Griffiths et al., 2018). Safe staffing levels have been codified in the UK with guidance from the National Institute for Health and Care Excellence (NICE) (National Institute for Health and Care Excellence, 2014). This guidance indicates

several metrics for analysing the impact of poor staffing, and these include falls, pressure ulcers and medication errors. National Health Service (NHS) trusts are required routinely to collect data on these, and they publish their staffing levels on a monthly basis.

Historically, increasing placements' capacity to host student nurses has been seen as problematic because of its impact on the relationship between staff facilitating practice learning and students: more students has been equated with less quality time with RNs (Hutchings et al., 2005) (Murray and Williamson, 2009). However, these considerations require further exploration in the face of a global shortage of nurses. In the UK, in the 2019 General Election, the Conservative Party (which became the party of government in December 2019) pledged to increase the numbers of nurses by 50,000 in their manifesto (The Kings Fund, 2019). This will not be achieved without increasing placement capacity.

In the UK, one method of placement learning discussed as having benefits for student nurses' learning and preparedness for registrant practice is Collaborative Learning in Practice (CLIP), in which greater numbers of students learn together in practice placements, with different year groups interacting, fostering responsibility and leadership skills through peer learning and support (Clarke et al., 2018). Under CLIP, student learning is facilitated by a coaching model, which requires RNs to supervise students' clinical care and decision making as distinct from predominantly delivering care themselves (Williamson et al., 2020b). Although our recent systematic review found little research literature evaluating the benefits of CLIP (Williamson et al., 2020c), what does exist seems to confirm these benefits and CLIP is being advocated by Health Education England (HEE, the UK government body responsible for supporting quality health education, see <https://www.hee.nhs.uk/>) and rolled out across the UK (Health Education England, 2017). We have been instrumental in this development in our region. Our evaluations have shown that students and the Registered Nurses (RNs) supervising and assessing them identified some of the potential benefits noted above (Williamson et al., 2020a; Williamson et al., 2020b). In some settings, the RNs were concerned about the reduction in direct

supervision that accrued when there were more students than they were used to, and believed that this might have issues for patient safety (Williamson et al., 2020a; Williamson et al., 2020b). From another perspective, however, it seems possible that having more students in a placement could be beneficial for patient care. Although students are not registered professionals, they are undergoing educational programmes to become registrants and logically therefore, increasing the numbers of students ought to have some impact on care outcomes. No literature exists examining the direct impact of student nurse numbers on patient safety, although it is clear that students identify strongly with patient safety, conceptually as well as practically (Fisher and Kiernan, 2019).

In the context of the introduction of CLIP and potential safety concerns expressed by RNs supervising and assessing students (Williamson et al., 2020a; Williamson et al., 2020b) , it was appropriate to quantify the impact that increasing student nurse numbers might have on patient safety. We have used the NICE safe staffing metrics of falls, pressure ulcers and medications errors to do so (National Institute for Health and Care Excellence, 2014).

Methods

This study was a retrospective cohort study, which assessed the impact on NICE patient safety measures (National Institute for Health and Care Excellence, 2014), of having students in placement being educated in CLIP compared to when they were not. In that sense, the cohorts were patients 'exposed' to CLIP and the concomitant additional student numbers, and those not 'exposed'. Cohort studies are non-experimental, observational designs, which compare outcomes between groups for exposures, without randomisation (Riffenburgh, 2012). Outcomes from subjects in each cohort are measured and can be assessed using risk ratios (RRs). Although not as strong a study design as the randomised controlled trial, which is still described as the 'gold standard' research methodology (Thomas, 2016), one strength of a cohort study is that outcomes measures can be standardised

(Ahn, 2016); another strength is pragmatism, meaning that groups from the 'real world' are studied, not created just for the research study (Ahuja, 2019). Therefore a retrospective cohort study was an appropriate design for this our aims.

The main direct difference between when a clinical area was running CLIP and not running CLIP was that in CLIP, any placement's capacity to host student nurses was increased, in some cases from two students to eight at any given time. We took CLIP to be in operation when there were three or more students in placement. This increase in capacity allows the peer collaboration to take place between year groups in a way that less than three students does not.

Aims

To quantify whether or not clinical areas operating CLIP models showed a reduction in reported patient safety outcome measures for falls, pressure ulcers and medications errors (National Institute for Health and Care Excellence, 2014) using routinely collected audit data, anonymised at source.

Data collection

We engaged with five of our local NHS trust partners and asked them to provide routinely-collected audit data on falls, pressure ulcers and medications errors in line with the NICE safe staffing guidance (National Institute for Health and Care Excellence, 2014). The data we have analysed relates to hospital wards as opposed to any community settings. These areas had run CLIP placements at least once and therefore had times when they have had substantial capacity increases of student nurses, sometimes from one or two students to as many as eight. Where we have amalgamated these data, we refer to them as 'adverse patient events' in the analysis and results below. The trusts were requested to anonymise data at source, so individual clinical areas were not identifiable outside the trust. The data spreadsheets trusts produced were collated in the trusts and emailed to the lead author. They were not shared with others in the research team. All data are reported anonymously. Areas that were regularly running CLIP, and where staff had completed training and were receiving local support, were identified using our placement database. W

Ethics

As the data collected in this study were routinely collected audit data, anonymised at source, no further ethical or regulatory approvals via the Health Research Authority (HRA) Integrated Research Application System (IRAS) was required. This was supported by the Medical Research Council/HRA research decision algorithm, and confirmed in writing by the local Assistant Research and Development Manager (Safety Reporting and Monitoring) in the Research Design Service, who advised that we obtain permission to proceed in each organisation; this we secured in writing from each trust Director of Nursing (or nominee).

3.2.2 Data analysis

We explored three research questions within our data. For the inferential testing, the α -level was set at 0.05 for all analyses. All analysis took place using SPSS 24.

1. Does having an increased capacity of student nurses in placements (under CLIP) have an impact on patients' risk of having an adverse event? We used a risk ratio (RR) to assess this. Data were combined for all trusts in this analysis.
2. Null hypothesis 1: There is no difference in adverse patient events when CLIP was running compared to when it was not running. We used paired samples t-tests (including two-tailed significance, bootstrapping and 95% Confidence Intervals) to compare adverse patient outcomes when CLIP was running and when it was not running (in other words, when clinical areas had increased capacity and when they did not have that increased capacity). We ran these analyses on combined trust data.
3. Null hypothesis 2: There is no correlation between student numbers in placement and adverse patient events. We used Pearson's r (with a two-tailed significance, bootstrapping and 95% CIs) to assess this hypothesis. We combined data for all trusts in this analysis. We also ran Pearson's correlations for each trust and for each adverse patient event (falls,

pressure ulcers and medications errors) to explore if there were any relationships between student numbers and types of adverse patient events in particular trusts.

Results

Of the five trusts where CLIP was in operation in our region, four returned patient data about adverse patient events for the NICE Safe Staffing guidance (falls, pressure ulcers and medications errors (National Institute for Health and Care Excellence, 2014). For the fifth trust, the contact did not respond despite several emails. We received data from the trusts for the period January 2018-August 2019 and these relate to 15 clinical areas in four NHS trusts. Data analysis took place in January-February 2020. In total, there were 5532 adverse patient events over 20 months, with 996 students going into these placements. We used our own records of student placement allocations to match student numbers and reported patient adverse events/month. It must be noted that for these 15 areas, there were a total of 314 possible months when students might have been placed and of those, CLIP was running with three students or greater in only 58 (18%) of the months.

Research question 1. Does having an increased capacity of student nurses in placements (under CLIP) have an impact on patients' risk of having an adverse event? The risk ratio when CLIP was running compared to when it was not running was 0.9842 (95%CI 0.9604-1.008). Although this is a small reduction, it means that increased capacity of students under CLIP reduced patients' risks of adverse patient events from the NICE guidelines (National Institute for Health and Care Excellence, 2014). This result must be interpreted with caution as the CI crosses 1; however, it is a very small encroachment at the upper limit (1.008). Bearing in mind that there were 5532 adverse events over 20 calendar months, if areas had always run CLIP, there would have been a reduction of 73 adverse patient events in total, which is a clinically important finding even if the CI questions the confidence of the result.

Research question 2. Null hypothesis 1: There is no difference in adverse patient events when CLIP was running compared to when it was not running. The Kolmogorov-Smirnov test was not statistically significant, indicating that the data were normally distributed and we could use the parametric paired samples t-test. Test statistics indicated that the mean for adverse patient events without CLIP was 362, and with CLIP was 83 events, and this was found to be statistically significant ($p=0.01$, mean difference 279, 95%CI 213-346). Therefore, the null hypothesis is rejected and there is a statistically significant difference in adverse patient safety events when areas were running CLIP compared to when they were not, with substantially greater mean adverse patient events without CLIP than with CLIP.

Research question 3. Null hypothesis 2: There is no correlation between the numbers of students in placement and patient adverse events. Pearson's $r = 0.150$, $p=0.264$ (95% CI -0.266-0.508). Therefore, the null hypothesis is supported and there is no correlation between increasing numbers of students in placement and increased numbers of adverse patient events. In order to explore the data further, we ran Pearson's r for each trust and for total student numbers and each adverse patient event (falls or pressure ulcers or medications errors). Only one of these calculations was statistically significant (relating to pressure ulcers and student numbers in one trust, $r=0.487$, $p=0.029$). However, when running multiple comparisons there is a risk of finding false positives and rejecting the null hypothesis (type I errors). Using Bonferroni correction is an accepted method for guarding against type I errors (Sedgwick, 2012), and when employed here meant that the acceptable p value would be $0.05/36 = 0.001$. Therefore, we disregarded this lone result. Thus, there is no relationship between increasing student numbers and increasing adverse patient events, or between increasing student numbers and increasing numbers of falls or pressure ulcers or medications errors, in our trusts in this analysis.

Discussion

The results of this study indicate that increasing numbers of student nurses in placement has a positive impact on patient safety, using standard measures from NICE safe staffing guidance (National Institute for Health and Care Excellence, 2014). These are internationally important findings because this is the first study of its kind to quantify benefits accruing from increases in student nurse placement capacity. More specifically, we have found that patients' risk of adverse events is marginally reduced and this is supported by a statistically significant difference in mean events when CLIP is running (and therefore there are more students in placement) compared to when it is not. Despite RN fears reported in our previous studies (Williamson et al., 2020a; Williamson et al., 2020b) that having more students in practice might be unsafe as their supervision arrangements could be compromised, we found that there is no statistically significant correlation between increasing student numbers (capacity increases) and increasing numbers of adverse patient events.

It is clear that patient safety is an abiding concern for all nurses (Fawcett and Rhynas, 2014), including student nurses (Sakamoto, 2019), but when there are shortages of RNs patient safety can be compromised (Ball et al., 2014), with episodes of care missed (Blackman et al., 2015), sometimes with serious consequences for patients. Student nurses remain supernumerary in the UK, meaning that they are not counted in the ward staff establishment but are required actively to participate in care delivery (Allan et al., 2011). Since 2019, students are assessed in placement by RN assessors who are different from the staff who supervise them on a daily basis (Nursing and Midwifery Council, 2018). CLIP does not alter these arrangements, however the coaching relationship CLIP requires is different from previous mentoring arrangements; instead, increases in the numbers of student nurses in placement means that there are more aspirant registrants looking after patients, able to meet their needs, helping each other through peer learning, and therefore a clinical area has greater attention to potential patient safety issues. Students are not fully functioning RNs but are trying to act like RNs (Teskereci and Boz, 2019), and so are building professional identity, skills and behaviours

at the same time as addressing patient safety issues. Based on the new UK Nursing and Midwifery Council standards for nurse education (Nursing and Midwifery Council, 2018), a uniform Practice Assessment Document has been adopted across most of England, with the reestablishment of assessed episodes of care (where a student is assessed every year on an event involving looking after a patient in clinical practice as opposed to an Objective Structured Clinical Examination in a simulation setting), and a medications management episode (involving medications administration and basic calculations). We speculate that this renewed focus on assessment in the clinical area may have further benefits for patient safety.

Limitations

This study analysed data from four NHS trusts in one English region, with adult nursing students placed in in-patient wards and departments and we make no claims relating to other settings where CLIP could be implemented, such as community or mental health care. We acknowledge that the data with which we have been provided are 'crude' because they do not take into account the severity of the adverse events, their nuances or their outcomes for individual patients, or time of day of occurrence of event, or other issues such as numbers of RNs on shift. These data represent only the number of events that took place. There will be variations between settings and between individuals in the interpretation and reporting of adverse patient events, and no doubt other events took place that have not been reported; this is unavoidable and we can only undertake analysis on the data we have. We also accept that there might be large variations in patient acuity between settings, between trusts and in different months of the year, and that this has implications for interpreting our findings (Mark and Harless, 2011). 'Winter pressures' (Kmietowicz, 2018) mean that elective surgical settings frequently become acute medical wards during winter, and ambulant elective surgical patients will have different acuity and thus reduced potential for adverse events, compared to wards with a high number of medically unwell, immobile, frail elderly patients. Again, we can only undertake analysis based on the data we have and we acknowledge this as a limitation in our results. We accept that our definition of when clinical areas were using a CLIP model is also

somewhat crude (this being when there were three or more students in placement), but as these placements would not routinely have had more than two students at one time previously, our 'three or greater' definition represents a capacity increase as well as an indication of CLIP utilisation.

Conclusions

This study is the first to quantify benefits to patient safety accruing from increasing the capacity of placement areas to host student nurses. It is internationally relevant because there is a global shortage of nurses (Marcé et al., 2019) which has been met in many places with concomitant attempts to increase the numbers of students in educational programmes. This is a 'supply side' solution that requires clinical areas to take greater numbers of students than had previously been the case if these additional students are to have clinical placements and learn by looking after patients. Far from increased student nurse placement capacity compromising patient safety, we conclude that our study indicates the opposite: concerning student nurses and patient safety, increasing numbers appears to have a beneficial impact on patient safety. We accept that our data and statistical analyses must be interpreted with caution. We recommend that further research takes place to investigate these issues more fully, particularly concerning the relationship between increased student nurse numbers, numbers of RNs and patient acuity, with larger samples, in national studies, and with international comparisons. We also recommend that further research investigates the implications of increased placement capacity on RNs' supervisory relationship with students.

List of abbreviations

Collaborative Learning in Practice. CLIP.

Health Education England. HEE.

Health Research Authority. HRA.

Integrated Research Application System. IRAS.

Registered Nurses. RNS.

National Health Service. NHS.

National Institute of Health and Care Excellence. NICE.

Nursing and Midwifery Council. NMC.

United Kingdom. UK

Declarations

Ethics approval and consent to participate

This study did not require ethical approval because it used routinely collected, anonymised audit data.

Consent for publication

Not applicable.

Availability of data and materials

The SPSS output dataset generated during analysis for the current study are available in the University of Plymouth repository (PEARL) at <http://hdl.handle.net/10026.1/15387>

Competing interests

There are no financial competing interests for all authors. We believe that there are no non-financial competing interests, however we acknowledge that we have all to some extent been involved in the development of CLIP in our region. AK was Associate Head of School for Placement Learning and HEE fellow with responsibility for implementing CLIP for the university department concerned in this study when it took place. JB is Quality Lead for HEE and involved in implementing CLIP in the same region. GW has been Principal Investigator on a number of CLIP-related research studies.

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Authors' contributions

GW and AK contributed to the conception and design of the work; GW was responsible for acquisition, analysis, and interpretation of data; GW, AK and JB drafted the work or substantively revised it; and have approved the submitted version; AND to have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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