

Education

Development of a tool to monitor paramedic clinical placements: a case study of innovation overcoming tradition

Sonja Maria BClinPrac is a PhD candidate and Lecturer in Paramedicine¹; Amanda Hlushak BSc, EMT-P, MHealthSc, MPParamedicPrac is a Lecturer in Paramedicine²; Adam Diamond Diploma in Paramedicine, MSc(OHS) is a Lecturer in Paramedicine¹

Affiliations:

¹Charles Sturt University, Bathurst, New South Wales

²Australian Catholic University, Brisbane, Queensland

<https://doi.org/10.33151/ajp.16.644>

Abstract

Introduction

This paper discusses a trial of the use of CompTracker© – an online platform used to link the student, preceptor and academic in a time sensitive manner during student clinical placement – within a cohort of 330 first and second year paramedic students studying at an Australian university. CompTracker© allows for preceptors to identify and assess clinical competencies, and for the student to reflect after each case is completed on placement. The tool was initially piloted, and then remodeled on several attempts to improve its overall functionality and relevance for the placement learning experience. The study aims to educate and inform other health disciplines that may have an interest in using online tools for competency tracking and education in diverse workplaces.

Methods

Multiple surveys were conducted over a 3-year period, using both Likert 5-point scales and open-ended questions, to evaluate 330 first and second year students' and 261 preceptors' experiences.

Results

Of the 54 student responses, 92% felt the tool was useful and 67% felt it was easy to use. Within the preceptor results, 63 ± 2% preferred CompTracker© over traditional paper-based methods.

Conclusion

CompTracker© can be used to support students and preceptors in clinical placement. The flexibility of this online tool makes it adaptable to most clinical workplaces, and should be considered in any workplace that requires the use of competency-based clinical assessment and used in place of traditional paper-based portfolios.

Keywords:

emergency medical technicians/education; feedback; preceptorship/methods; clinical clerkship

Corresponding Author: Sonja Maria, smaria@csu.edu.au

Background

Charles Sturt University (CSU) in New South Wales has offered a paramedic clinical degree since the mid-1990s, making it the earliest paramedic tertiary degree worldwide (1). While not unique to CSU, many teaching programs have documented challenges in providing clinical placements. These include the timely delivery of feedback to students, the value of assessments, equity and value of placements, and ongoing support for professional development of preceptors (2,3). Of particular note, these challenges highlight the difficulty in monitoring and supporting students (and their preceptors) on placement in a time sensitive manner, which is a common occurrence throughout many universities (4-6).

In 2014, the workplace learning (WPL) team (an administrative team used to liaise between the ambulance services providing placement, the student and the academic coordinating the placement subject) identified that the traditional paper-based portfolio for paramedic students was failing to meet the needs and expectations of students. This was consistent with previous research in other health disciplines which also documented difficulties in communication, the appropriateness of placements, capacity building and inadequate preparation contributing to a universal struggle of providing quality clinical learning for students (4-12).

The WPL team's experience, combined with research, suggested that while clinical placements are essential to bridging the theory-practice gap, there is a commonality of barriers that exists between the student, the university and the placement provider/preceptor (such as an ambulance service, hospital or clinic) (2,3,13). These barriers include a perceived lack of communication between the university and ambulance service personnel which often found students arriving for placement unannounced or unexpected and with paramedics unaware of student requirements. Other factors compounding the problems were the appropriateness (and equity) of placement sites between rural and metropolitan areas that affect workload density and opportunities for student learning. These factors, in combination with inconsistent and untimely feedback, diminished the quality of the clinical learning experience by impairing the engagement and collaboration between the student, preceptor and university. Research into the provision of timely clinical feedback has been conducted in several other industry settings with positive results (2-4,13-16). Johnston, MacQuarrie and Rae reported that undergraduate paramedic and nursing students felt their simulation skills were improved when they were allowed to reflect on their performance and given immediate feedback to help with skill consolidation and improvement (16).

Before 2014, CSU used a post-placement assessment task that attempted to demonstrate student competency based on a list of cases attended, a presentation of case studies and a preceptor feedback report (mentor reports). Given the

use of post-placement assessment, we were challenged with the ability to deliver timely and constructive feedback and often failed to recognise the support some students may have required because communication happened after the events had taken place. (This was also identified as a serious concern by our placement providers.) CSU's experience is not alone in this case and similar research has identified that this poor follow-up and communication are a common and significant issue in many clinical placement settings, of which paramedicine, as a burgeoning profession, has struggled to overcome (17-21). The aim of this research was to work collaboratively with our placement providers, students and preceptors to develop a time sensitive web-based application that delivers timely feedback, improves communication, provides access to clinical reflections and flags critical events.

Conceptualising the new tool

Previously CompTracker© has been used in Canadian ambulance services to monitor paramedic student competencies, primarily against the National Occupational Competency Profiles (22). CompTracker© can capture student competencies that are completed under preceptor supervision (normally a qualified paramedic) whereby the preceptor is able to assess the student against a standardised ranking scale, or an individualised competency statement. While this is an efficient way of tracking competence, overreliance on competencies as the only gauge of learning can be problematic and issues surrounding competency-based medical education have generated increasing attention and debate among health professions (23). This debate dates back more than 60 years, whereby students were trained based on competencies related to curricula rather than the 20th century idea of time-based assessments. More recently there has been a push to return to a competency-based education model that aims to focus on the learner, not just the curricula. This stems from an argument that health discipline students need to demonstrate proficiency in all domains of their intended practice (23-25).

While CompTracker© in its original form was used as an assessment tool, it can also be used to adjunct educational and learning opportunities. By modifying the software it can incorporate tasks that prompt rationale-led assessments whereby students are required to link the competency to a deeper level of critical thinking. An example of this is where a skill is demonstrated, but there is also discussion around the appropriateness of using or withholding the treatment. The context of each case with regard to the patient, illness, severity, scene and location becomes important and relevant. These types of modifications can be done easily and quickly within the CompTracker© software (available in both web-based and mobile applications). CompTracker© is also capable of reporting on student reflections, cases and feedback within a cohort in less than a minute. This can be adapted to identify difficult situations that need timely response within the software. Previously, these reports would take hours or days, depending on when cases were required to be submitted.

Methods

Our first pilot version of CompTracker© was implemented in 2014 with a group of 40 first year students randomised into two equal groups: CompTracker© versus traditional paper portfolio method. This was within a community placement subject where students had to complete 90 hours in various locations with multiple mentors. Survey data was collected after placement was completed. Given the benefits and ease of use stated by the students of the small pilot, CompTracker© was then rolled into all clinical placement subjects within the paramedic program from 2015 onwards. In total, 335 undergraduate students enrolled across second and third year placement subjects were invited to use the CompTracker© software; 330 went on to use the software and five elected to use the traditional paper-based version (mainly due to phone or internet issues). Students were given a 2-hour tutorial and 2-hour lecture on the software before going on placement. There were 261 preceptors involved in the study. The WPL team travelled to preceptor workplaces to discuss and demonstrate the online application where possible. This included demonstrating the two available platforms for use of the software: web-based and Apple phone compatible (initially the software only had Apple app compatibility, not android). However, this was sometimes difficult as preceptors were not always available for training or were interrupted by ambulance call-outs.

Four surveys were delivered by Survey Monkey and completed between 2014 and 2017. Students and preceptors used CompTracker© both nationally and internationally during this time and were asked to complete a questionnaire using 5-point Likert scale (5 = excellent, 1 = poor) and open text questions. Emails were sent to all preceptors asking them to participate in the questionnaire after each placement period (end of semester) and surveys were open for 1 month.

Ethics

Ethics approval was obtained from the Charles Sturt University Human Research Ethics Committee. Informed consent was obtained from all participants using the Survey Monkey tool, before starting the survey.

Data analysis

All Likert scale data was analysed using the Statistical Package for the Social Sciences (SPSS version 24, IBM). Descriptive statistics were recorded as mean \pm standard deviation or as a percentage for most data as appropriate. Two-sample t-tests were used when comparing responses for New South Wales preceptors to overseas or interstate. Open-ended responses were thematically analysed which involves the search for, and identification of, common threads that extend across a transcript or set of transcripts (26). These were analysed using a method as described by Braun and Clarke where six-steps

of data processing occur and until concordance was achieved within the team (27). The steps include familiarisation with the data, generation of initial codes, searching for themes, defining themes and production of the results. The WPL team then used these themes alongside statistical data to triangulate issues of functionality which could result in future modification and improvement to the CompTracker© application.

Results

Paramedic students

A total of 54 responses were received from the students over the study period (16.4% response rate): 83.3% of students on placement in the New South Wales Ambulance Service, 5.6% in the Australian Capital Territory Ambulance Service, 9.3% in the London Ambulance Service (LAS), and 1.8% in Queensland Ambulance Service.

With regards to the overall user interface of the program, 92% of students felt they had adequate training on CompTracker© before their use of the program (Figure 1) after the single tutorial and lecture; 89% felt the program was very easy or easy to use; and 11% felt the program was difficult to use (Figure 2). Within the open-ended questions, the main feedback in this area was that training should be timed nearer to when the placement starts, as the delay negatively affected their ability to recall how to use the program.

Almost 15% of students felt disappointed with the level of engagement of preceptors using CompTracker© but the majority did find that engagement improved throughout their placement experience as the preceptor familiarised themselves with the online application (Figure 3). Of note, several students stated that younger preceptors were more open to using a computer program to sign off cases and felt there was less resistance to using a new concept among younger preceptors. Having multiple preceptors became stressful for students as they had to train each one on the new program when the preceptor changed.

Within the student cohort, 63% 'absolutely' or 'mostly' preferred the CompTracker© program over the paper-based method compared to 23% who said, 'not really' or 'absolutely not'. The major criticisms were that the program felt slow and cumbersome compared to using a paper-based book. The online application seemed to be 'glitchy' with times of data loss, during data entry of the case. Initially, the application was only available as an Apple or Windows platform but the android platform is now operational. This was a major obstacle as about 40% of Australians use Android phones (28). In the positive comments, students felt that CompTracker© was more detailed and comprehensive than the old paper-based approaches and that they appreciated the fact that the information would be kept electronically and was accessible for them to reflect on. The idea of building an electronic portfolio that could be used later for employment purposes was exciting and worthwhile.

Ambulance preceptors

In total, 261 preceptors were involved in the surveys, of these 221 (80%) worked within NSW. Of the NSW cohort, 58% identified they worked in a metropolitan area versus 42% regional. There were 21 (8%) from other states within Australian and 19 (7%) were international. Of the 3500 case logs submitted during our first year of placement there were 2800 signed off and over 1800 (64%) of these had additional feedback provided for student development by the paramedic preceptors. This is a considerably larger group than the student cohort who took part in the surveys, but understandably each student may have up to four or more mentors during their clinical placement.

Within the free text comments many preceptors stated their hesitancy in viewing the platform for the first time and felt resistance to change to a new system. However, in Q11, 'How would you rate the communication and support from CSU throughout the placement experience?', a positive response

was recorded in $65 \pm 8\%$ of cases. In Q 13, 'Pending time and availability, would you be willing to attend a workshop on preceptoring with CompTracker© run by a CSU staff member and facilitated with the ambulance services education unit?' almost half of the participants $48 \pm 7\%$ said yes, and another $33 \pm 6\%$ said they would consider attending a training program. Within the free text fields, respondents stated this was an improvement over traditional methods of paper-based approaches.

Preceptors appeared to prefer the web-based application over the mobile device $63 \pm 2\%$ versus $56 \pm 3\%$, although this was not statistically significant ($p=0.09$). Further analysis of the qualitative data provides some insight as preceptors felt there was more time to pay attention to details when back at the station looking at a computer than when under time constraints at cases or at hospital, and preferred this to using a mobile device.

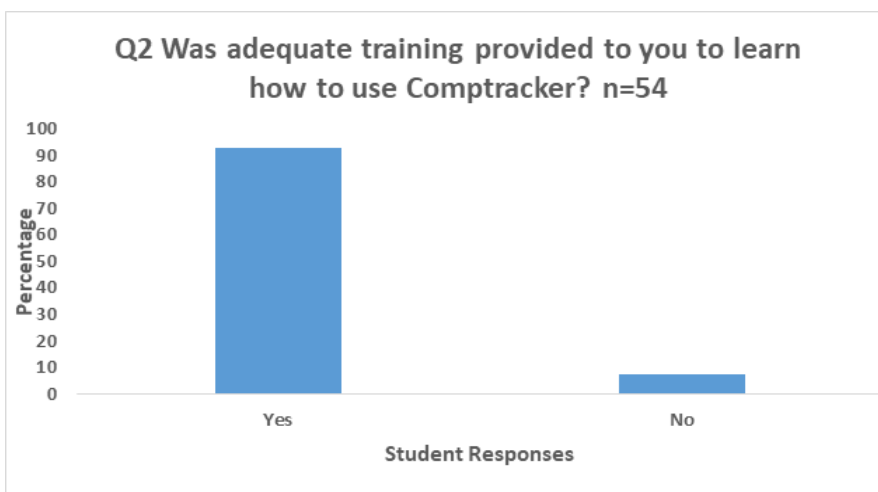


Figure 1. Training on the use of CompTracker©

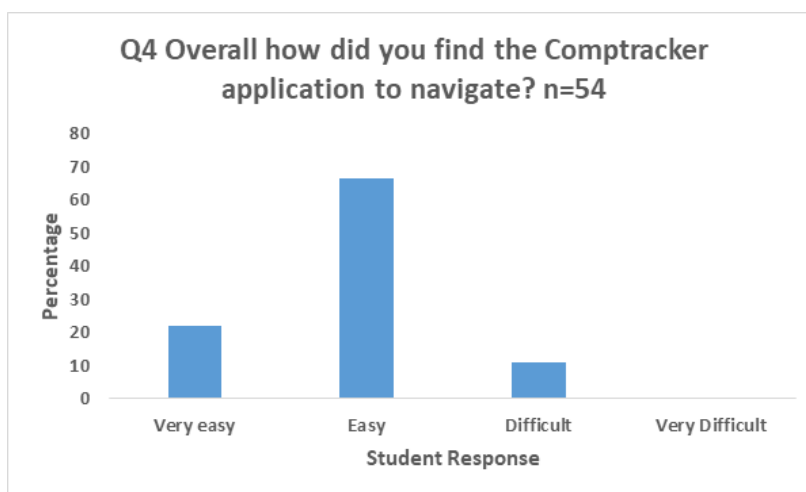


Figure 2. Ease of use within the application

Figure 4 presents data comparing overseas, interstate and New South Wales Ambulance (NSWA) preceptors. NSW preceptors (76%) felt that using the application provided a better experience for them as a mentor as opposed to preceptor overseas or interstate (56%), although marginally not significant ($p=0.07$). All groups of preceptors thought CompTracker© gave them a better understanding of student requirements than previous years (for competencies and evaluation), however (and again), the overseas and interstate preceptor cohort ($69 \pm 10\%$) did not compare as favourably as NSW ($76 \pm 4\%$) preceptors. Overall, $89 \pm 3\%$ of preceptors thought the software was good for assessing students against Council of Ambulance Authorities (CAA) accreditation standards and felt that this should be initiated for students from other universities on placement. Finally, $65 \pm 10\%$ of all

preceptors would recommend CompTracker© versus $33 \pm 6\%$ who would not.

Open-ended responses – examples of feedback that instigated software changes

From Survey 2016 student (46) comment: ‘The options for participation include ‘observed’, ‘assisted’ and ‘lead the job’. Maybe it is only me, but I felt quite arrogant to select ‘lead the job’. Although I lead a large number of jobs towards the end of my placement, I was regularly and constantly assisted by my preceptors throughout, when I got stuck they took over. I felt embarrassed for my preceptor to sign-off these jobs with the impression that I had done most of the work. ‘Lead with assistance’ I felt would be more appropriate.

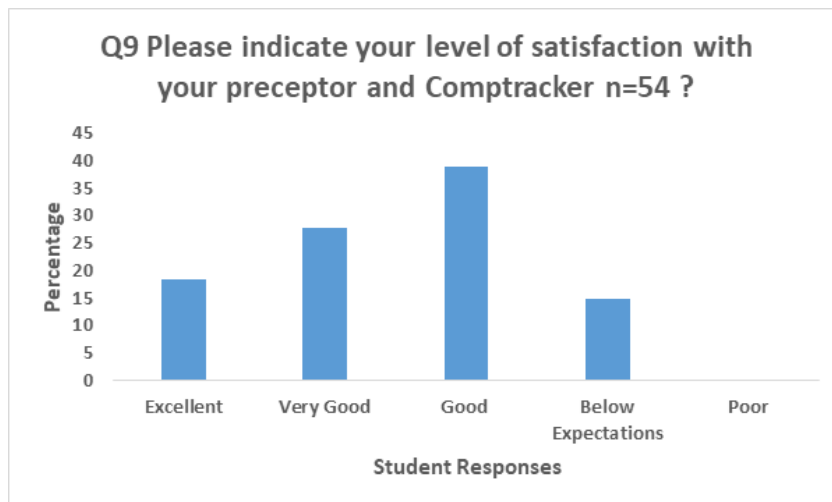


Figure 3. Level of satisfaction with preceptor using CompTracker©

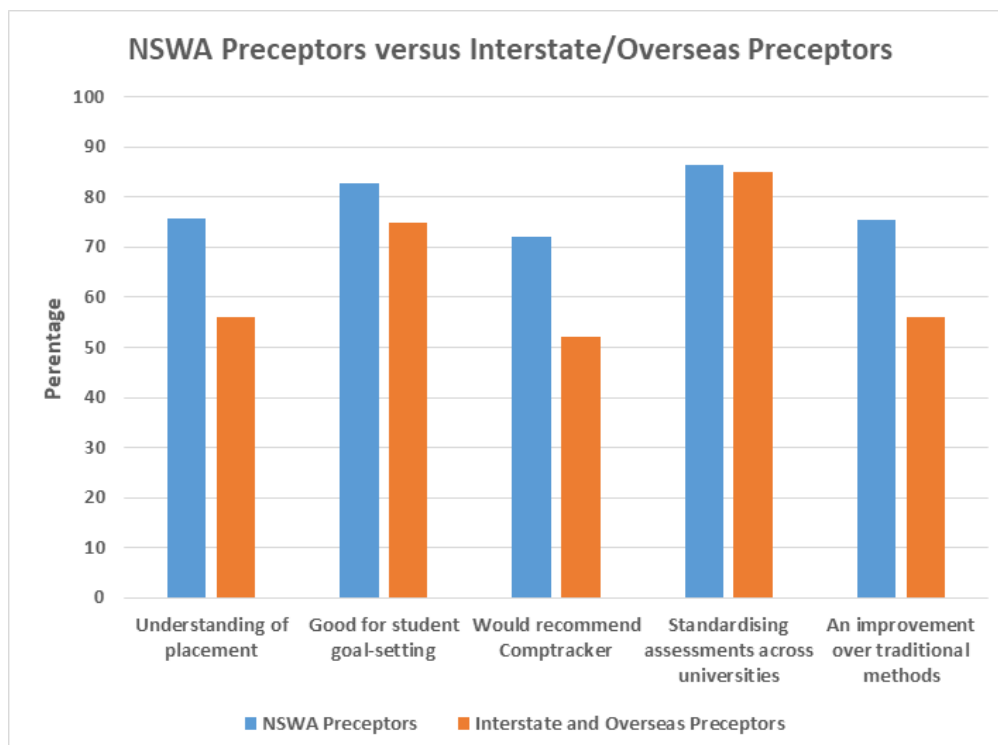


Figure 4. A comparison between NSW preceptors, and interstate and overseas preceptors

This comment from a survey in 2016 resulted in us changing the language around how a student perceived their role on a case. 'Lead with job' was replaced with 'lead with assistance'.

From Survey 2016 preceptor (79) comment: 'Depending on whether the student chooses phone or computer. I had more time to think through my responses when I had access on the computer, other students that choose phone just handed me their device and I felt I had to immediately sign off without considering responses.'

This comment gave us insight about how preceptors provided feedback during placement and how they may prefer to do this during 'downtime' rather than on the road. We are planning to explore this in future versions with cross-references to metropolitan versus rural locality (in particular high density workload). We may need to rethink how students request their feedback from preceptor with regards to timing.

From Survey 2017 preceptor (141) comment: 'I think the ability to provide perhaps a 'final' statement to them (students) would be of benefit – that way we could outline what we thought were good traits and what we think they could work on for next placement. Some paramedics are not good at giving critical feedback or having confrontations with student paramedics.'

This statement and similar others prompted us to allow for a more informal approach to critical feedback in the next version and we updated the layout. We also provided some additional feedback about what we were looking for in this section.

Discussion

Over time the potential to monitor and track students became increasingly evident as we understood where, and in what timeframe, our students were achieving competence. By using tracking software, data could be collected on skills and exposure to cases alongside mentor feedback. This allowed academic staff the opportunity to support the learning experience, and in real time, positively influence the learning outcomes for the placement subject by adding in theory and/or additional material to align alongside placement competencies. Furthermore, after placement was completed, we had the ability to collate the data alongside paramedic preceptor feedback and collaborate with our industry partners to improve future student placement and education delivery. This primarily involved reviewing feedback on skill gaps.

The use of the CompTracker© application has shown to be a positive and effective way to track clinical assessments and competencies and offer real-time feedback including educational opportunities during placement when compared to the old paper-based post assessment used at CSU. These benefits include flexibility within the application itself to modify

and adapt the tool to meet the needs of the subject learning outcomes and placement requirements.

Through consultation between students, preceptors, ambulance service and academics, CSU students now have an online application for clinical placements which has pulled the traditional logbook and portfolio out of the 20th century and into a new age of technology. The current version of CompTracker© is student focussed and allows the ability to develop skills and competencies, as well as providing an ongoing tool for education and continuing professional development. Once a student submits to 'the cloud' (an online and remote storage facility for the data) the preceptor can offer feedback and constructive critique to the student. This gives students an opportunity to improve their clinical practice through feedback provided by their preceptor. It also allows the academic to track the placement and provide additional support or educational material if required to both the preceptor and student.

CompTracker© is useful to offer support following a critical event or situation requiring a collaborative approach to student exposures. Critical events are notifiable events that occur within ambulance services and are categorised within the NSW health system into three groupings. The three levels define categories and types of cases where students may need additional support services or intervention by peer support or the CSU academic.

During 2016, a total of 27 critical events took place whereby interventions from the academic occurred within hours to ensure students were cared for appropriately. Previously, there was difficulty when knowing if students required support for critical events and we relied heavily on the ambulance service initiating contact. This often led to a delay in notification, sometimes even weeks after the event, and a missed opportunity to provide welfare and support. With timely feedback, we can contact the student as soon as the system has been notified that a critical event has occurred. Additionally, we are able to track the number of requests for support services and industry implemented debriefing sessions that are occurring looking for any trends or issues requiring further enquiry.

CompTracker© is also able to break down cases submitted into workload patterns to follow trends. In particular, attendance to differing call types, which is convenient when considering what students are attending to and where this occurs. Figure 5 provides a snapshot of the data that can be investigated within CompTracker© and shows the types of case presentations attended to by undergraduate paramedic students in both second and third year clinical placement subjects. This data can also be further refined to demonstrate metropolitan or rural localities. Reports are easy to build within the program, which can be collated regularly to see updates on both student progress and competencies. This allows our WPL team to refine teaching methods and concentrate on the areas needing enhancement for improved student engagement. From the data

collected so far, we have implemented changes that include highlighting the importance of scene awareness, revisiting patient assessment techniques and strengthening verbal and handwritten handovers.

While the online application is versatile, one of its greatest assets is the linking of feedback between the student and preceptor. Overall, students found the tool to be a positive medium for preceptor engagement and found the feedback to be beneficial. From a preceptor perspective, competencies are clearly outlined in the tool, which also allows the preceptor to give timely feedback to the student to improve their practice. Within the CompTracker© online application many preceptors provided feedback on the quality of the students' learning and were able to suggest concepts which would be of most benefit to the learning experience for both student improvement and subject improvement.

Limitations

Limitations of the study

This study has limitations, first is the limited formal education for the preceptors using the online application. CompTracker© has an online tutorial program that can be utilised for training purposes, however it did not appear many of the preceptors utilised this option. This then led to reactive problem solving and possibly accounted for the lower satisfaction rates of using the application in the interstate and overseas preceptor cohorts. The NSW cohort had the opportunity to link in with WPL staff who travelled around to the stations, whereas the interstate and overseas cohort had limited contact. This needs further exploration to really understand the issues.

Additionally, we cannot fully appreciate the differences of why the web-based tool was preferred over the mobile application and our intentions are to break this down further in future surveys. We speculate that preceptors may feel better

equipped to reflect on the student and the case in the downtime at station as opposed to 'on the fly' in transit or at hospital. But this again requires further analysis.

Limitations of the current tool

A limitation of the tool itself, and not so much the study design, is in the management of critical events. Currently, critical events are self-identified and flagged by students during their case log entry or potentially picked up by the placements coordinator when reviewing the case log. This has the potential to miss critical events and delay intervention when self-identification is used. Future work is happening that will allow an automated flagging system based on key words written by the student during their case log entries to prompt an instant message alert the preceptor and clinical placement academics about a critical event.

Currently (in 2019) CompTracker© is available on all operating platforms, but in the initial phase (2015) was only available on Apple and Window devices (excluding Android users). This potentially delayed entries until a desktop computer could be sourced to enter data into the application. This would have adversely affected up to 40% of students who used Android devices during this period, decreasing their satisfaction with the software platform. Luckily this issue has now been overcome with the offering of the program on all platforms.

The cost of CompTracker© for universities could be restrictive due to the expense of the software. Currently, each student per session costs \$50 (AUD), however, there are price reductions for bulk student enrolments which are calculated to lower the expenditure by up to 43% depending on numbers of enrolment. While it is of the authors' opinion the costs are worthwhile, it may not be reasonable for others.

Last, we acknowledge that the sample size was small for the known population of students. The number represents a

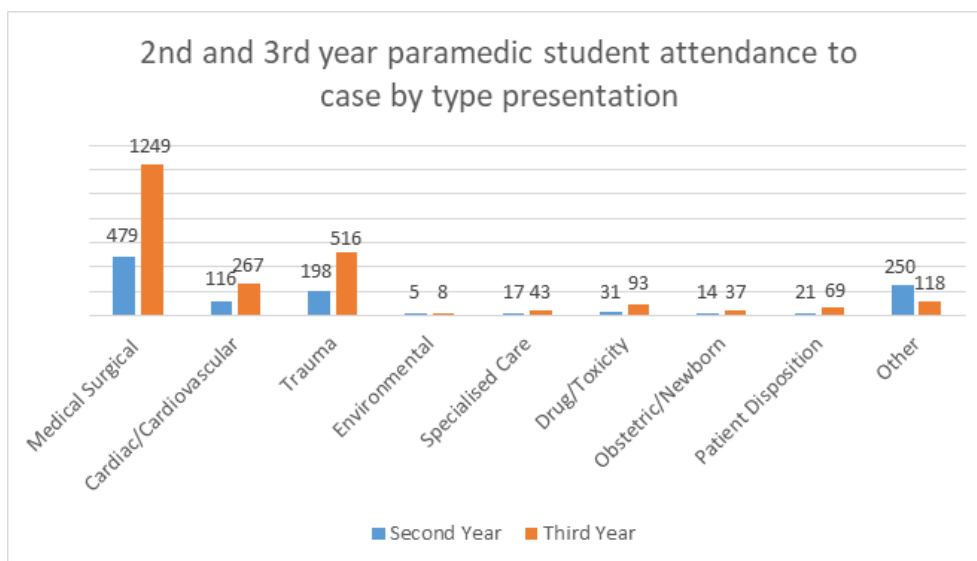


Figure 5. Comparison between second- and third-year undergraduate paramedic student attendances to case presentation

confidence interval of 90% with a margin of error of 10.3%. Ideally, we would have liked to achieve a significant effect size, which would have required a further minimum 20 students to participate. Although the consistency in the responses provided a clear indication that the tool had successes and challenges. However, the student responses were quite clear regarding the challenges and highlights of using the software, and in particular the open-ended responses provided valuable data where Likert scales would have been limited.

Future work

Since paramedic registration has now occurred in Australia, CompTracker© will be a useful tool to allow students to capture their clinical hours, meet the specified competencies through the Australian Health Practitioner Regulation Agency and track continuing professional development. Each student is able to print a summary of their achievements to use towards their ongoing registration process. Further research is required to look at improving the tool to ensure the capturing of reflective practice, feedback and competencies to monitor clinical practice. Our next iteration of CompTracker© will likely explore new tools for monitoring as well as reporting functions.

Conclusion

There is no doubt CompTracker© is a useful tool to track, monitor and improve clinical placements in a paramedic program. It allows for time-sensitive reflective feedback and a medium by which cases, critical events and trends can be tracked. Since its implementation, CompTracker©'s uptake has been positive among stakeholders engaged at CSU, primarily because of the flexibility within the application and ease of use. It has been used to track knowledge gaps and identify skills requiring improvement such as scene awareness, revisiting patient assessment techniques and strengthening verbal and handwritten handovers. Given these functions of the software, it can be easily adapted to fit within educational institutions with large student numbers and ambulance services facilitating large placement numbers. We acknowledge the value and quality of the paramedic workforce that are sharing their knowledge with students and guiding them through the placement experience.

Conflict of interest

The authors report no conflicts of interest. Each author of this paper has completed the ICMJE conflict of interest statement.

Authors' contributions

Sonja Maria completed the writing of this article with assistance in the editing phase by Amanda Hlushak. Adam Diamond who is the workplace coordinator assisted to write the survey tools and additionally has continuously worked on CompTracker© updates throughout the project.

Acknowledgements

We would like to acknowledge both the efforts and collaboration of our industry partners in working with us to develop this tool, and the preceptors and students for both providing important feedback. We are looking forward to version four in 2019 and working collaboratively again to further improve the clinical placement experience.

References

1. Lord B. The development of a degree qualification for paramedics at Charles Sturt University. *Journal of Emergency Primary Health Care* 2003;1(1).
2. Michau R, Roberts S, Williams B, Boyle M. An investigation of theory-practice gap in undergraduate paramedic education. *BMC Med Educ* 2009;9:23.
3. Lucas P, McCall M, Lea E, et al. Clinical placements in residential care facilities part 1: positive experiences. *Journal of Paramedic Practice* 2013;5:400-6.
4. McCall L, Wray N, Lord B. Factors affecting the education of pre-employment paramedic students during the clinical practicum. *Journal of Emergency Primary Health Care* 2009;7(4).
5. O'Meara P, Williams B, Dicker B, Hickson H. Paramedicine clinical placement duration and quality variance: an international benchmarking study. Bendigo, Australia: La Trobe University, Australia HW; 2014.
6. O'Meara P, Williams B, Hickson H. Paramedic instructor perspectives on the quality of clinical and field placements for university educated paramedicine students. *Nurse Educ Today* 2015;35:1080-4.
7. Hickson H, O'Meara P, Huggins C. Engaging in community conversation: a means to improving the paramedicine student clinical placement experience. *Action Research* 2014;12:410-25.
8. Hickson H, Williams B, O'Meara P. Paramedicine students' perception of preparedness for clinical placement in Australia and New Zealand. *BMC Med Educ* 2015;15:168.
9. Kennedy S, Kenny A, O'Meara P. Student paramedic experience of transition into the workforce: a scoping review. *Nurse Educ Today* 2015;35:1037-43.
10. O'Brien K, Hartley P, Dawson D, Quick J, Moore A. Work readiness in paramedic graduates: what are employers looking for? *International Paramedic Practice* 2013;3:98-104.
11. Wallin K, Fridlund B, Thorén A-B. Prehospital emergency nursing students' experiences of learning during prehospital clinical placements. *Int Emerg Nurs* 2013;21:197-203.
12. Williams B, O'Meara P, Hickson H. Paramedicine students' views on clinical placement learning using the DREEM inventory. *J Nurs Educ Pract* 2015;6:35-42.

References (continued)

13. Lucas P, McCall M, Lea E, et al. Clinical placements in residential care facilities part 2: negative experiences. *Journal of Paramedic Practice* 2013;5:462-8.
14. Ruston A, Tavabie A. An evaluation of a training placement in general practice for paramedic practitioner students: improving patient-centred care through greater interprofessional understanding and supporting the development of autonomous practitioners. *Qual Prim Care* 2011;19:167-73.
15. Sharghi NR, Alami A, Khosravan S, Mansoorian MR, Ekrami A. Academic training and clinical placement problems to achieve nursing competency. *J Adv Med Educ Prof* 2015;3:15-20.
16. Johnston T, MacQuarrie A, Rae J. Bridging the gap: reflections on teaching interprofessional communication to undergraduate paramedic and nursing students. *Australasian Journal of Paramedicine* 2014;11(4).
17. Hou XY, Rego J, Service M. Review article: paramedic education opportunities and challenges in Australia. *Emerg Med Australas* 2013;25:114-9.
18. Lloyd A. Informing practice: information experiences of ambulance officers in training and on-road practice. *Journal of Documentation* 2009;65:396-419.
19. O'Brien K, Moore A, Dawson D, Hartley P. An Australian story: paramedic education and practice in transition. *Australasian Journal of Paramedicine* 2014;11(3).
20. Smith E. A review of twenty years of competency-based training in the Australian vocational education and training system. *International Journal of Training and Development* 2010;14:54-64.
21. von Vopelius-Feldt J, Bengler J. Who does what in prehospital critical care? An analysis of competencies of paramedics, critical care paramedics and prehospital physicians. *Emerg Med J* 2014;31:1009-13.
22. Paramedic Association of Canada. National occupational competency profile (NOCP) 2018. Available at: <https://paramedic.ca/site/nocp?nav=02>
23. Frank JR, Snell LS, Cate OT, et al. Competency-based medical education: theory to practice. *Med Teach* 2010;32:638-45.
24. Leung W-C, Diwakar V. Competency based medical training. *BMJ* 2002;325:693-7.
25. Loftus S. Competencies in medical education: a trap for the unwary. *Med Sci Educ* 2016;26:499-502.
26. DeSantis L, Ugarriza DN. The concept of theme as used in qualitative nursing research. *West J Nurs Res* 2000;22:351-72.
27. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77-101.
28. Statcounter GlobalStats. Mobile Operating System Market Share Australia 2018. Available at: <http://gs.statcounter.com/os-market-share/mobile/australia>