

# From Beginner to Competent: The Influence of Simulation in Paramedicine Education

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## Introduction

Paramedics handle a diverse range of medical and trauma cases, where any lapse in competency can compromise patient safety and outcomes (1, 2). It's crucial for student paramedics to meet the high standards set by oversight bodies to protect both the profession and the public. Growing evidence indicates that simulation facilitates attainment and reinforcement of clinical competence (3). However, there is limited evidence exploring the impact of simulation on developing clinical competence in undergraduate paramedicine students.

## Aim

The aim of this study was to determine whether there is an association between weekly practice sessions performance and summative practical exam performance among paramedicine students in a simulated setting.

## Methods

This study involved a retrospective analysis of assessment outcome data collected from 2019 to 2024 within the Griffith University paramedicine program using the clinical competence assessment tool (CCAT). The CCAT is used by paramedic sessionals to assess student performance and provide structured feedback during simulated scenario-based practical sessions. These were held weekly over a 12-week trimester, culminating in a summative practical exam in week 13. The focus was on evaluating students' performance during the first 12 weeks, based on practice scenario CCAT scores (practice scenarios). Students' performance in these practice scenarios were then compared to the summative exam CCAT scores (exam scenarios) in week 13 of the Cardiac course.

Linear regression analysis was performed to determine if there was a statistically significant improvement in clinical competence over the trimester through to the exam. Spearman's rank correlation was used to determine correlations in frequency of practice scenarios performed and improved performance in exam scenarios; whether better performance in practice scenarios showed improved performance in exam scenarios; and whether pass rate percentage in practice scenarios showed improved performance in exam scenarios. Ethics approval for the study was obtained from the Griffith University Human Research Ethics Committee (GUHREC Ref No: 2024/073).

## Results

Six years of assessment data were included in the analysis, with an average of 50 students per year (n=305). In five of the six years, there was a positive gradual improvement in clinical competence across weeks 1 to 13. However, in 2020, a negative trend in performance was observed for both practice and exam scenarios, likely due to the significant reduction in the number of practical sessions caused by COVID-19 lockdowns. Outside of the COVID year (2020), of the five years that observed an upward linear trend, three of these years were statistically significant (2021 [ $r_s=2.7$ , 95% CI 1.2 to 4.2,  $p=0.002$ ], 2022 [ $r_s=1.6$ , 95% CI 0.45 to 2.68,  $p=0.011$ ], and 2024 [ $r_s=1.09$ , 95% CI 0.2 to 1.9,  $p=0.019$ ]). Moreover, the increasing frequency of practice scenarios performed across all six years showed a statistically significant positive correlation with performance in exam scenarios ( $r_s=0.232$ ,  $p<0.001$ ).

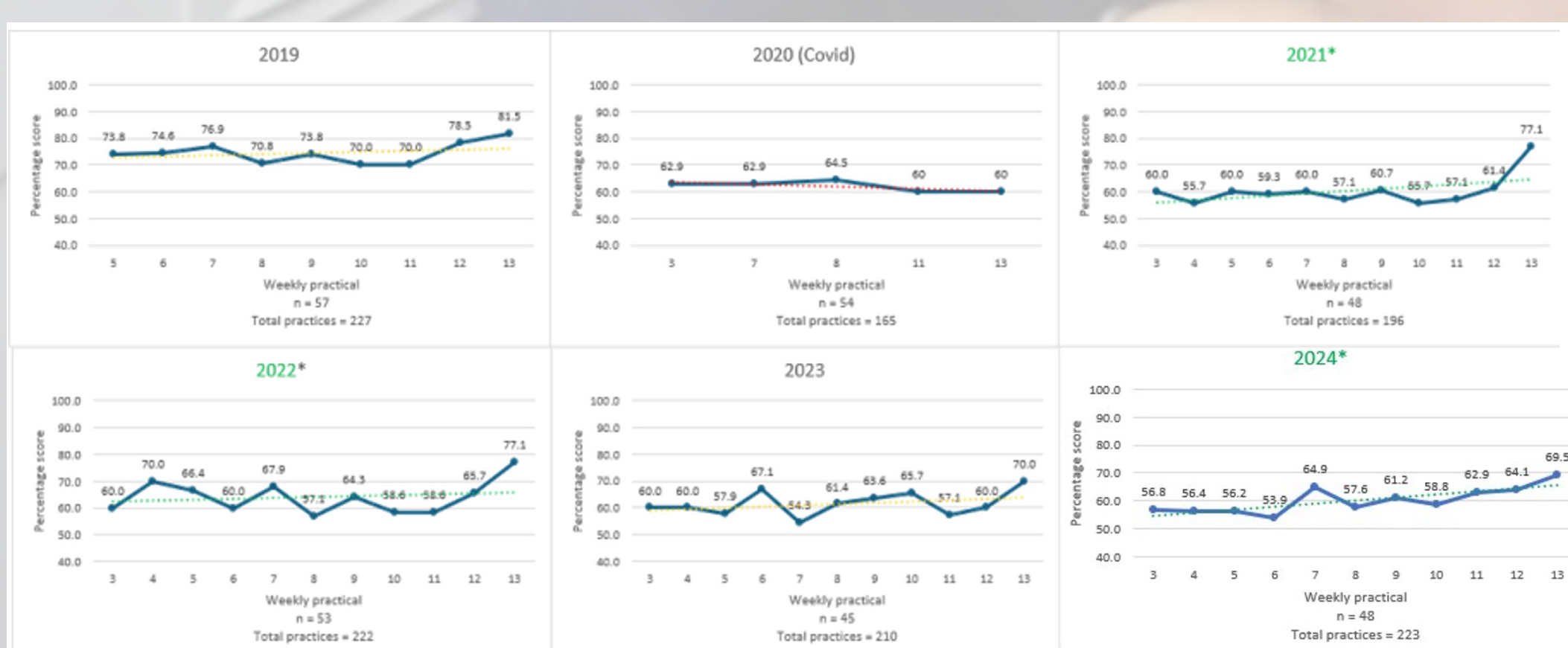


Figure 1: Linear Regression Analysis of Clinical Competence (CCAT score) throughout the Trimester

Similarly, students' performance in practice scenarios also demonstrated a statistically significant positive correlation with their performance in exam scenarios ( $r_s=0.241$ ,  $p<0.001$ ). The pass rate percentage in performance in the practice scenarios had a weak but statistically significant positive correlation with performance in the exam scenarios ( $r_s=0.149$ ,  $p=0.017$ ).

Table 1.: Spearman's Rho testing results.

Spearman's Rho testing	Correlation Coefficient: Performance in summative exam CCAT score	Significance (2-tailed)
Frequency of practice scenarios performed	0.232**	<0.001
Performance in weekly practice CCAT scores	0.241**	<0.001
Pass rate percentage in weekly practice CCAT scores	0.149*	0.017

\*\*Correlation is significant at 0.01 level (2-tailed). \*Correlation is significant at 0.05 level (2-tailed)  
Abbreviation/s: CCAT, clinical competence assessment tool

## Discussion

This study shows a clear, progressive enhancement in the clinical competence of paramedicine students through weekly practical sessions. This improvement persisted despite varying weekly content and different paramedic sessionals assessing performance, highlighting the sustained impact of consistent simulation exposure. These findings align with existing research in health professions education, where simulation significantly bolsters clinical skills (4).

Using Kirkpatrick's four-level evaluation model, the study provides strong evidence that simulation-based education effectively addresses the first three levels: learner satisfaction, knowledge acquisition, and performance improvement (5). Although the fourth level, focusing on patient outcomes, is less explored in paramedicine, the study's results indicate a promising trend similar to other studies (6-9). The positive correlation between the frequency of practice scenarios performed and improved exam scenario performance underscores the importance of repeated, structured simulations in developing clinical competence. Moreover, statistically significant positive correlations between students' performance in weekly practice scenarios and their exam scenarios emphasise the value of regular, formative assessments in enhancing learning outcomes. The modest yet significant correlation between pass rate percentage in practice scenarios and performance in the exam scenarios further suggests that cumulative practice contributes meaningfully to overall competence.

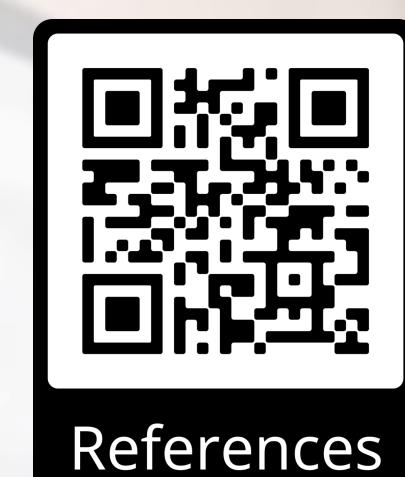
The dip in 2020 performance due to reduced practical sessions during COVID-19 reinforces the necessity of regular, hands-on practice in maintaining and improving clinical skills. These findings support integrating frequent, structured simulation and debriefing sessions into paramedicine curricula to maximise student competence and readiness for real-world practice (10, 11). Future research should explore the long-term impact of these strategies on patient outcomes, solidifying simulation's role in paramedic education.

## References

Scan the QR code for a list of the references.



Figure 2: Example of the simulated scenario-based practical sessions



References