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Our cover photo this issue features Dublin Fire Brigade ambulance service. Photo courtesy Ray McMonagle, Dublin Fire Brigade.

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PROFESSIONAL

NON-TECHNICAL ATTRIBUTES IN PARAMEDICINE: IS SITUATIONAL JUDGEMENT TESTING THE SOLUTION?

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Abstract**Background**

Non-technical attributes have been identified as important and desirable qualities for all paramedics. Despite this, there is currently little research exploring the assessment of non-technical attributes in paramedicine. Situational judgement tests (SJT) have been identified as a valid and reliable assessment of non-technical attributes in medical education; however, it appears there is no research exploring the use of SJTs in the field of paramedicine. This paper outlines the background information on SJTs, what they are and their successful implementation in medicine. Additionally, this paper identifies potential uses for SJTs in paramedicine including admission and mental health screening based of previous research in medical education. This paper concludes that SJTs could be utilised in the field of paramedicine to measure non-technical attributes.

Keywords: Allied Health Personnel; Non-technical skills; Paramedics; Situational Judgement Tests

Introduction

In recent times there has been greater recognition that non-technical attributes such as professionalism, integrity, empathy and communication are critically important predictors of job performance.(1, 2) This has been a large area of focus in medical education research over the last 20 years, with arguments claiming that academic and technical ability alone is insufficient to make the transition to a competent clinician.(3) Patterson et al (2016) has demonstrated this through a longitudinal study where the predictive performance of academia decreased through the student's transition from study and into practice.(4)

Non-technical attributes have previously been identified as an important skill set within paramedicine with international sources referring to their importance for practicing as a paramedic.(2) Despite this, there is little evidence within paramedicine on the best way to embed or assess for these attributes. The only study to date investigating the assessment of non-technical skills within paramedicine is through the use of Multiple Mini Interviews (MMI).(2) Tavares and Mausz (2013) conducted a 2-day, 10 station MMI and 10 station simulation-based assessment on final year Canadian paramedic students who had not yet practiced as independent clinicians. The study focussed on several non-technical attributes including communication, teamwork, critical thinking and problem solving. Tavares and Mausz (2013) found that MMI were a reliable and valid measure of non-technical attributes whilst also observing a moderate positive relationship between non-technical attributes and clinical skills. Participants reported neutral opinions to the MMI but reported it would not stop them from applying for paramedic programmes.(2)

Contrary to this, Hissbach et al (2014) have argued that MMI's are not a fair assessment method suggesting results are open to bias from assessors.(5) Additionally, previous research has been inconclusive in supporting the construct validity of MMI assessments and this remains an area for further exploration.(3) This therefore provides some uncertainty and opportunity to explore other methods for the best way to measure non-technical attributes.

Over the last 20 years Situational Judgement Tests (SJT) have emerged as an effective tool at measuring non-technical attributes in medicine and has gained significant popularity in this time; particularly in larger scale assessment processes.(1) SJTs and MMIs have both been proven to have higher predictive validity over character references and personal statements in medicine, whilst SJTs alone have been found to have significant validity in predicting future job performance.(3) Other benefits that SJT have over MMI is they are cost effective, less resource intensive and remove the risk of interviewer bias.(3, 6) Currently, it appears that there is no research involving the use of SJTs in the field of paramedicine. Therefore, this paper aims to provide background information on SJTs, what they are, how they have been successfully implemented into medical education and whether SJTs have a place or application in paramedicine.

What are Situational Judgement Tests?

SJTs are designed to assess an individual's judgement in hypothetical situations, with a goal of assessing interpersonal or non-technical attributes opposed to clinical knowledge.(1,7) They are associated with personality, cognitive ability and job knowledge.(8) Generally, SJTs provide a challenging written situation (vignette) to the individual that they may encounter in their target role.(9) Individuals are then required to identify an appropriate response to this situation from psychometrically tested pre-selected answers.(1, 7) It is important to note that SJTs are a measurement methodology opposed to a specific assessment style, as formats and response styles can vary significantly across assessments.(1, 10, 11)

Theory behind SJTs

SJTs require the candidate to select non-technical traits to display in certain situations, they aim to determine how a person would act, rather than what the individual thinks they should do. SJTs are underpinned by two key behavioural theories (11). These include the long-standing Behavioural Consistency Theory and the growing theory of Implicit Trait Policies (ITP).(12, 13)

Behavioural Consistency Theory postulates that past behaviour is an indicator of

future behaviour. Thus, assessing a candidate's response to a situation should dictate how they would react to a similar situation in the future.(12) ITP proposes that individuals develop behavioural beliefs and how behaviours/traits are interpreted and perceived in certain situations.(13) Individuals use these beliefs to determine which behaviour to portray in the given moment. ITP theorises that individuals choose a behavioural trait to display as opposed their behavioural tendencies.(13)

Different delivery styles of SJTs

Generally, SJTs are delivered to the candidate in either written or video-based formats. Written SJTs are conducted where the test taker is presented with a written/text based hypothetical situation vignette. Video-based SJTs require the test taker to watch a video scenario (usually acted out) that targets set non-technical attributes. Both formats require the candidate to determine the appropriate response from pre-selected answers psychometrically developed by subject matter experts.(11, 14)

Written SJTs (see Text box 1 for example) are a more cost-effective option to develop and maintain compared to video SJTs.(11, 15) Furthermore, written SJTs have been found to have a higher cognitive demand than video-based SJTs (15). Patterson et al (2016) argues that this may be beneficial in the setting of "high stakes" environments such as medicine that require a higher-level cognitive thinking.(11) Video-based SJTs have been found to have a higher predictive and incremental validity at measuring non-technical attributes in comparison to written SJTs.(3, 15) Lievens et al (2006) argues this could be due to the ability to collect information on facial expressions, body language and voice inclinations from video based SJT's, which play a significant role in interpersonal interactions.(15)

Further research has been conducted using alternate delivery methods including computer-based SJTs (16) and iPads (17). Both of these were found to be effective and would further alleviate the resource intensiveness required to score SJTs.

A patient examination is taking place between a physician and patient at a large tertiary hospital; a final year paramedic student is undertaking their clinical placement there and is observing the examination. The physician advises the patient that she needs some further tests to rule out terminal cancer. The physician is urgently called away leaving the paramedic student alone with the patient. The patient is visually distraught and asks the paramedic student what the blood test will show.

How appropriate are the each of the following responses by the paramedic student in this example?

1. Explain to the patient that he is unable to comment on what the tests will show as he is only a paramedic student.
2. Acknowledge the patient's worry and ask whether he would like them to be raised with the physician.
3. Suggest to the patient that he poses these questions to the physician when they return into the room.
4. Advise the patient that he should not worry and that it is unlikely that he will die.

Text box 1. Example of a written-based SJT

Different response styles

An area that has received relatively little research is the effects that response formats have on an SJJ.(18) SJTs generally adopt either a knowledge base or behavioural tendency approach to the response instructions.(11) Knowledge base responses require candidates to choose what is the best option in the situation, whereas behavioural tendencies ask the candidate what they are most likely to do in the situation.(19-21) Advantages have been identified for both with behavioural tendencies being more closely aligned to interpersonal and non-technical attributes, whilst knowledge base response

instructions have been found to be more cognitively involved.(20, 22)

Response formats are then determined against a scoring rubric which has been ideally psychometrically designed with subject matter experts.(11) Generally, the scoring rubrics consist of test takers ranking actions in order, rating actions independently, multiple choice or best/worst response.(11) Despite these scoring methods being used regularly, little evidence has been offered into which method has superior psychometric properties.(18) Furthermore, previous research has indicated that small changes to these scoring rubrics have been found to alter the validity and reliability of an SJT significantly.(11, 18)

Arthur et al (2014) determined that the rate response format was found to have the highest internal consistency and incremental validity when assessed in comparison to the rank and most/least likely in the same SJT.(18) Alternatively, Dore et al (2017) provided candidates with an alternate response method asking candidates to write an open-ended response to the SJT. These results were found to predict candidate personal characteristics with a similar accuracy to the way GPA assess cognitive function.(6) Further research is required to determine the validity in comparison to traditional SJT response formats.

Student Perceptions

SJTs have been introduced into medical school admissions and have also been piloted for the use in dentistry.(7, 24) Evidence from these studies suggests that candidates found SJT assessments to be fair and appropriate whilst maintaining a high face validity.(7, 23, 24) Furthermore, Lievens (2013) found from post SJT questionnaires that candidates felt that SJTs were more relevant to the profession and less difficult in comparison to other cognitive assessments.(24) Goss et al (2017) additionally documented that SJTs conducted in Australia raised awareness to learners of the issues new doctors may face in the workplace.(25) These preliminary results suggest that SJTs are perceived well by candidates and may provide workplace context to questions and situations the learners are yet to face through their studies.

Are SJT's Fair?

Fairness of selection criteria has become heavily discussed within medical education as health service providers such as hospitals are required to select candidates that meet the job requirements while also promoting diversity within the applicant pool.(11) Literature indicates that females tend to score higher on SJTs compared with males (11, 23) which is consistent with other non-academic assessments.(11) Lievens (2013) supported this, finding that females performed higher in non-technical SJT whereas males performed higher in cognitive SJTs.(24) Despite these gender differences, Lievens (2013) identified SJTs appear to have low adverse effects on ethnicity, suggesting the use of SJTs may attract a wider ethnicity of candidates, hence increasing the ethnic demographic.(24)

How would SJTs benefit paramedicine?

Previous medical literature has proven SJTs to be reliable and valid, testing multiple interpersonal characteristics including professionalism, integrity, communication, resilience and emotional intelligence.(8, 26-28) These non-technical qualities are critical attributes for paramedics and are important domains in paramedic education and accreditation requirements.(2, 29-33) Therefore, it would be a reasonable assumption that paramedicine could benefit from utilising SJTs in measuring non-technical attributes. However, this has not been empirically explored in the paramedicine sector. Fortunately, the empirical work undertaken by medical education has offered insight into some of the uses of SJT. These uses have been summarised below along with the implications for the field of paramedicine.

Admission Screening

SJTs have successfully and reliably proven to predict job performance and training outcomes in medicine when used in conjunction with an educational performance measure.(13, 34) As such, SJTs have become increasingly more popular over the last decade for use in health care selection in the UK along with medical admissions in Belgium and Australia.(11, 24, 25) Within ambulance services, pre-employment and

course enrolment screening of candidate suitability is generally a difficult task. This creates a “bottle-neck” effect on university graduates all bidding for limited graduate paramedic positions at the conclusion of their studies. Given the previous success of SJT screening in medicine, the authors argue there could be benefit from adopting a similar approach in paramedicine to limit the resource intensive nature of applicant screening. Furthermore, SJTs offer a fair, reliable and valid pre-employment screening tool to ensure applicants possess the appropriate non-technical attributes to perform in the role of a paramedic prior to admission into the job.

Mental Health

Mental health issues are a growing concern within the field of paramedicine and it has been proven the negative effects that health care work can have on an individual’s health. (8) SJTs have been used in multiple medical studies to explore the effects of mental health.(8, 26) Pangallo et al (2016) explored the use of resilience (which has been linked to increased mental health and wellbeing) in palliative care workers.(8) Pangallo et al (2016) found excellent reliability and predictive validity of SJTs in measuring resilience levels in palliative care workers. Research has also been conducted through the use of SJTs to determine the relationship between emotional intelligence and wellbeing. The findings indicating those who have higher emotional management had a higher psychological wellbeing.(26)

Although mental health research through the use of SJTs appears limited, it is evident that previous research has supported SJTs as a successful tool at assessing and identifying mental health indicators. This provides opportunity in the field of paramedicine, where SJTs could be utilised to screen the current or incumbent workforce for risk factors (such as resilience) to identify at risk behaviours or traits. This would mean that at risk individuals could be identified, monitored and receive assistance earlier rather than later, improving overall workforce wellbeing and mental health.

Assessing and teaching non-technical skills

Another potential utilisation of SJTs is to determine whether they can measure the teaching of non-technical attributes in the setting of paramedicine. Medical education has previously found SJTs to successfully determine multiple non-technical attributes within medicine. Thus, SJT’s could be used in the assessment of pre and post paramedical studies of particular non-technical attributes such as empathy, teamwork etc. The results could then be used to determine whether these non-technical attributes are being taught or developed at tertiary education institutions, or inherently already possessed by students prior to arrival to university. This would assist in determining the effectiveness of current course curricula and graduate outcomes whilst identifying key areas for development. Additionally, the results could help shape future university curricula and learning outcomes to incorporate teaching/development of non-technical skills.

The HCPC and wider UK health department have been investigating ways to measure professionalism within paramedicine.(35) SJT’s could be utilised to measure and address an individual’s understanding of professional behaviour. This could provide organisations information about the workforce to help determine workplace learning needs, helping to shape future workplace training.

Conclusion

The use of SJTs in medical education has occurred for over 20 years. In this time, they have been found to be a valid and reliable assessment tool at predicting non-technical attributes and future job performance. It appears there is currently no research investigating the assessment of non-technical attributes using SJTs in paramedicine. Future work is needed to examine if SJTs are valid and reliable in paramedicine; if so, they could change the way applicants are selected, improve mental health and wellbeing and also change the shape of future education.

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RESEARCH ARTICLE

**INDICATORS OF PARAMEDIC SERVICE USE BY
COMMUNITY DWELLING OLDER ADULTS****Matthew S. Leyenaar** MA PhD(c)^{1*}, **Walter Tavares** PhD^{2,3}, **Gina Agarwal** MBBS PhD^{1,4}, **Andrew P. Costa** PhD¹*leynam@mcmaster.ca **OPEN ACCESS ARTICLE**

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Abstract**Introduction**

Home care clients represent a patient group that may be served through community paramedicine (CP) programs. The Detection of Indicators and Vulnerabilities for Emergency Room Trips (DIVERT) scale was recently validated to identify levels of risk for use of emergency care among this population. The objective of our study was to investigate whether home care clients that were identified as being at higher risk based on their DIVERT scores were more likely to use paramedic services to access the emergency department within 90 days of assessment when compared to clients that had lower DIVERT scores.

Methods

A retrospective cohort study was conducted using regularly collected administrative data. Home care assessment data were supplemented with data on emergency department (ED) visits. Arrival by ambulance was modelled to control for DIVERT scores as well as several social and demographic variables.

Results

Within the cohort, approximately 40% of individuals visited an ED within 90 days of a home care assessment and almost half of all individuals visited an ED more than once within a year. About two-thirds of clients that visited an ED in the 90 days following assessment used an ambulance for transportation. DIVERT scores were predictive of paramedic service use with highest scores indicating 4.15 times higher odds of arriving at the ED by ambulance (95% CI 3.60-4.78).

Conclusion

The results indicate that the DIVERT scale can be used to identify community dwelling older adults that are likely to use paramedic services to take them to the ED. Further investigation of aspects of social isolation, carer resiliency, time of use, and characteristics associated with ED discharge are warranted. Using the DIVERT scale as a case-finding tool may help community paramedicine and home care agencies improve care for frequent ambulance users among this population.

Keywords: ambulance utilisation; patient-care management; risk factors; home care services; community paramedicine

Introduction

The task of case-finding patients at risk of using the emergency department (ED) includes the challenge of considering interactions between multiple disease processes.(1) A case-finding tool was recently developed and validated to identify levels of risk of ED use for home care patients.(2) The Detection of Indicators and Vulnerabilities for Emergency Room Trips (DIVERT) scale generates six levels of risk for ED visits—from one (lowest score) to six (highest score)—following a standardized home care assessment.(2) Scores are determined by a variety of factors including past use, clinical diagnoses, key interventions, and other assessment findings (see Figure 1).(2) The performance of the DIVERT scale as a pre-emptive case finding tool is driven in part by community dwelling older adults’ history of emergency department visits and hospital admission.(2) It differs from other predictive tools by using ongoing symptoms and health conditions to differentiate levels of risk.(2) While DIVERT scores have been effective in identifying patients at risk of ED visits, the role of paramedic services in facilitating transport for these patients has not been investigated.

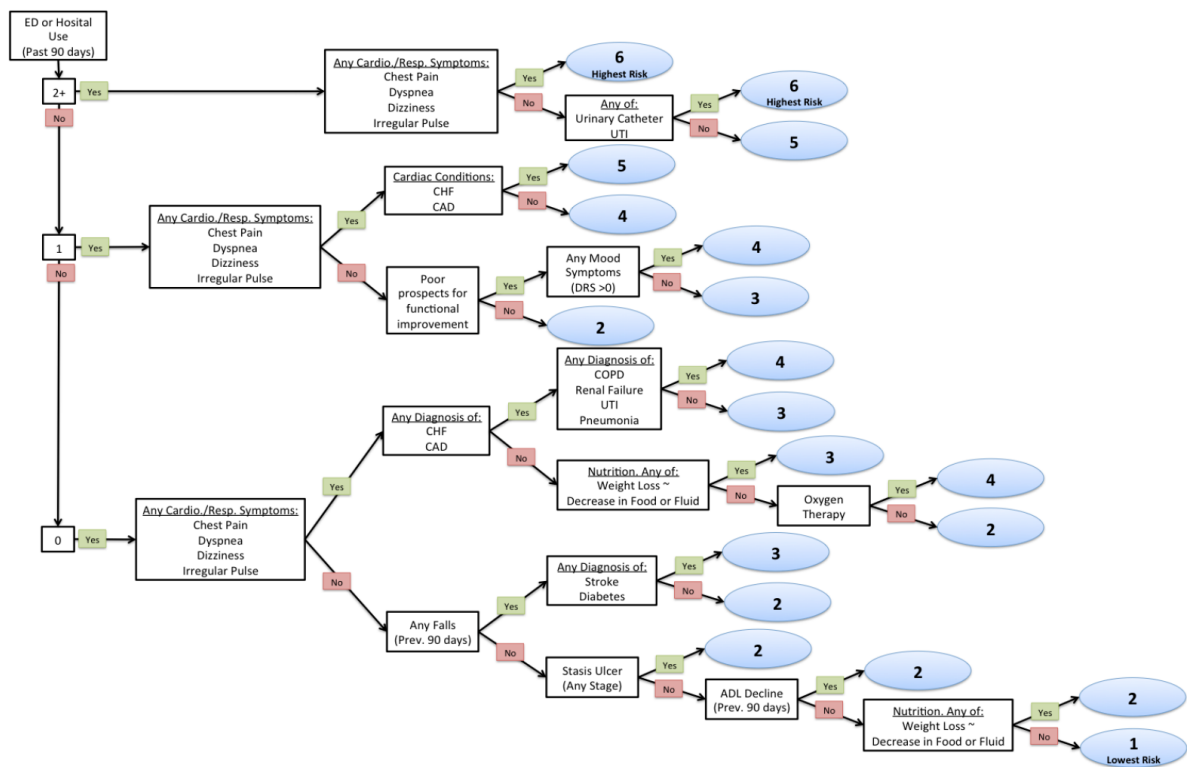


Figure 1: The logical algorithm for calculating the DIVERT scale (2)

Evidence about paramedic service use by older adults does not usually consider home care clients specifically, but studies have shown that older adults can account for a large percentage of patients transported.(3,4) Home care populations are frequent users of the ED despite community-based care programs that are intended to maintain patients' health within their home.(1,5,6) If designed and implemented effectively, these programs can reduce the risk of deterioration in health status or independence loss.(7,8) For example, “Aging at home” programs have shown that patients can maintain independence at home without being transported to the ED with the assistance of a multi-disciplinary team.(9) However, complexities of multiple disease processes and difficulty navigating health care have been associated with use of EDs even when home care services are in place. (10) Many patients who visit an ED are not admitted to hospital, suggesting a lower acuity event and/or a preventable condition that may be amendable to earlier or alternative intervention. This assumes detection of modifiable risk factors is available. (11)

Community paramedicine is an example of an innovative approach in healthcare

in response to pressures associated with an aging population and fiscal constraints.(11) Community paramedicine programs leverage the community of practice in which paramedics' work, often by expanding their scope of practice to identify needs and promote healthcare access across the continuum of care.(12) Tools used by paramedics to facilitate community based referrals for home care (13), community resources, or primary care (14,15) are limited. Broadening the role of paramedics in healthcare suggests opportunities exist to explore how they might be better utilized in their community of practice which includes home care patient populations. Identifying patients who could benefit from home care or who may require enhanced home care services may be advantageous for paramedic services interested in engaging in preventative care through community paramedicine. Further case-finding tools are needed to assist community paramedics in care planning for patients and to facilitate information sharing between care providers. The DIVERT scale could be used to identify community dwelling older adults who are likely to use paramedic services for transport to an ED. The objective of this study was to investigate whether patients that were identified as being at higher risk for an ED visit based on their DIVERT scores were more likely to use paramedic services within 90 days of assessment when compared to clients that had lower DIVERT scores.

Methods

Overview

A retrospective cohort study using data derived from regularly collected administrative records was used to investigate paramedic service use by community dwelling older adults. Data about the home care patient population was collected that included risk of ED use (through DIVERT scores) and subsequent use of paramedic services (through mode of arrival) documented for ED visits that occurred after the assessment of risk. Data were tested to determine if DIVERT scores were predictive of paramedic service use. The research was approved by the Hamilton Integrated Research Ethics Board (#1650).

Setting

Data were obtained from the Hamilton Niagara Haldimand Brant (HNHB) Local Health Integrated Network (LHIN) (including the former HNHB Community Care Access Centre (CCAC)). The HNHB region is situated in southern Ontario, Canada and is bordered to the east by the United States with Lake Ontario to the north, Lake Erie to the south and greater parts of the province to the west. The population of the region is approximately 1.4 million people who are served by 13 ED sites.

Sample and Data Sources

We compiled a sample of all patients that received a home care assessment conducted by care coordinators for the former HNHB CCAC between April 1, 2015 and March 31, 2016. The home care assessment must have utilised the Residential Assessment Instrument for Home Care (RAI-HC) (16) assessment instrument to be considered. The RAI-HC is used by HNHB LHIN to determine eligibility for home care services. It includes items assessing function, cognition, medical history, social and demographic indicators (e.g., age, gender, living arrangement, educational level, geography), and items that inform risk scores and decision support tools (including DIVERT). Receiving a RAI-HC assessment does not mean that an individual receives home care services, but it does identify risk factors at intake. If home care services are provided, these assessments are routinely repeated every 6 months to assess any changes in patient conditions. Care coordinators typically have a nursing background and assessments are typically completed in a patient's place of residence. The HNHB LHIN Integrated Decision Support provided access to data on hospital usage from the National Ambulatory Care Recording System (NACRS) that was linked to home care assessment data. Matched home care assessment and hospital utilisation data were provided for all patients in the cohort. One year of home care assessment records were provided with 15 months of records of corresponding to ED visits to the 13 ED sites through data from the HNHB LHIN. NACRS data included acuity, disposition, mode of arrival (by land ambulance or other), and date and time information. Data were provided having been processed for

quality assurance, matched, and de-identified (meaning that any data with missing fields were not included).

Variables

Independent variables available for analysis included DIVERT score and a variety of social and demographic information included in the RAI-HC assessment instrument. Age, gender, living arrangement, education level, and whether or not the individual lived in a rural location (as determined by postal code) were included as confounding variables that could influence the use of paramedic services. For example, individuals that lived in a rural location may display different tendencies in use of paramedic services than individuals that live in urban areas. Similarly, those that lived alone may use paramedic services differently than those who lived with a spouse or carer. The dependent variable of interest was whether clients used paramedic services for transport to hospital ED within 90 days of assessment or not.

Analysis

Preliminary review of the data was conducted to consider distribution of the variables. It was expected that distribution of the DIVERT scores within the cohort would not be evenly distributed as previous work showed that roughly 5% of the home care population are expected to have a score of 6, but close to 70% of these clients are expected to visit the ED (2).

To test whether DIVERT scores were associated with increased likelihood of paramedic service use, a multivariate logistic regression model was devised. Adjusted odds ratios (ORs) were evaluated for models that had statistically significant independent variables (95% confidence intervals that did not include the value 1.00). Plausible interaction terms were investigated for significance. Model performance was considered through a series of tests that considered goodness-of-fit, discriminatory performance, likelihood ratios, multicollinearity, and outliers. All analysis was performed using SAS version 9.4 (SAS Institute, Cary NC).

Results

Our final cohort was composed of 24283 patients (see Table 1). There was a higher proportion of female patients 61.67% (n=14973) and the mean age was 78 years (SD=13.8). Differences between the groups of patients that did and did not use paramedic services within the 90 days following assessment are evident. Our results show that 65.31% (n=6189) of all clients that visited the ED in the 90 days following assessment, did so using paramedic services. The mean length of time between assessment and first paramedic service use for these individuals was 29.31 days (SD=24.47). While the exposure of interest was use of paramedic services within 90 days of assessment, 18.17% (n=3287) of those arriving at the ED within that period did not use paramedic services. A larger proportion of the group that used paramedic services made repeated ED visits over the course of the year (87.27%; n=5401 compared to 33.37%; n=6038).

DIVERT scores showed increasing likelihood of use of paramedic services from an OR of 1.40 (95% confidence interval [1.25-1.58]) for a score of 2 up to an OR of 4.15 ([3.60-4.78]) for a score of 6 (when compared to a score of 1). A variety of combinations of models were tested using the variables shown in Table 2. While unadjusted ORs for age (OR=1.01 [1.01-1.01]), gender (Male OR=1.23 [1.16-1.31]), and living arrangement (with a carer) (OR=0.85 [0.80-0.90]) were statistically significant, testing various combinations of their inclusion with DIVERT scores failed to improve model performance beyond modest levels. Interactions between terms also did not improve model performance. As a result, DIVERT scores without other variables pertaining to social factors was demonstrated as an appropriate predictor of paramedic service use.

The performance of the logistic regression model of DIVERT scores as a predictor of paramedic service use had an Area Under the Curve (AUC) of 0.61. Figure 2 illustrates the ROC curve for the model. Youden's Index was used to demonstrate discriminatory performance. The cut-point that maximizes Youden's Index is a probability of 0.28 which results in a sensitivity of 0.529 and a specificity of 0.638 (see Table 3). If an intervention were to be based on this cut-point, it would translate into

66.7% false positive rate and 20.2% false negative rate.

Variable	Total	%	Did not use ambulance in 90 days following	%	Used ambulance in 90 days following	%
n	24283		18094		6189	
Visited ED within 90 days of assessment	9476	39.02	3287	18.17	6189	100.00
Used ambulance at some point during the year	9771	40.24	3582	19.80	6189	100.00
Visited ED more than once during year	11439	47.11	6038	33.37	5401	87.27
Mean time between assessment and first ED			119.09	(±94.15)	29.31	(±24.47)
DIVERT score of 1	3058	12.59	2609	14.42	449	7.25
DIVERT score of 2	6730	27.71	5422	29.97	1308	21.13
DIVERT score of 3	4669	19.23	3511	19.40	1158	18.71
DIVERT score of 4	5232	21.55	3708	20.49	1524	24.62
DIVERT score of 5	2997	12.34	1912	10.57	1085	17.53
DIVERT score of 6	1597	6.58	932	5.15	665	10.74
Male	9310	38.34	6708	37.07	2602	42.04
Live with a caregiver	12438	51.22	9462	52.29	2976	48.09
Attended post-secondary	4999	20.59	3775	20.86	1224	19.78
Rural location	3726	15.34	2806	15.51	920	14.87
Mean Age		78 (±13.8)		77.54 (±14.2)		79.37 (±12.8)

Table 1. Summary of study cohort

Variable	Odds Ratio (95% Confidence interval)
DIVERT score of 1	1.00
DIVERT score of 2	1.40 (1.25-1.58)
DIVERT score of 3	1.92 (1.70-2.16)
DIVERT score of 4	2.39 (2.13-2.68)
DIVERT score of 5	3.30 (2.91-3.74)
DIVERT score of 6	4.15 (3.60-4.78)
	(Unadjusted)
Age	1.01 (1.01-1.01)
Male	1.23 (1.16-1.31)
Live with a Caregiver	0.85 (0.80-0.90)
Attended Post-Secondary	0.94 (0.87-1.01)
Rural	0.95 (0.88-1.03)

Table 2. Odds of using ambulance within 90 days of assessment

Variable	Estimate	Probability of event	Predicted at 0.28 cut point	Observed
Intercept	-1.75			
DIVERT score of 1		0.15	0	
DIVERT score of 2	0.34	0.19	0	
DIVERT score of 3	0.65	0.24	0	
DIVERT score of 4	0.87	0.30	5232	1524
DIVERT score of 5	1.19	0.36	2997	1085
DIVERT score of 6	1.42	0.42	1597	665

Table 3. Resulting probabilities from model

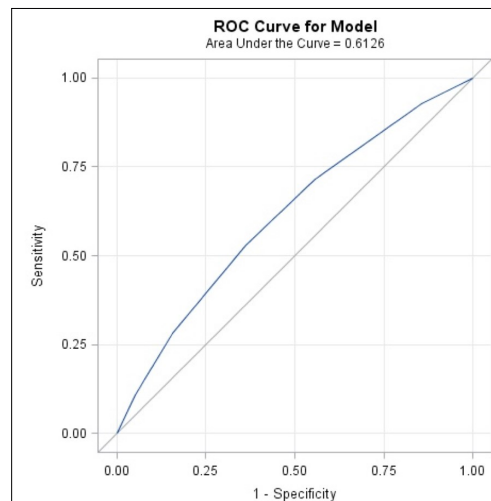


Figure 2: Receiver Operator Characteristic curve for logistic regression model of use of paramedic services predicted by DIVERT scores.

Discussion

The results demonstrate that DIVERT scores are predictive of paramedic service utilization by home care patients in the 90 days following RAI-HC assessment and validate application of DIVERT scores to predict the use of paramedic services as a mode of arrival for an ED visit. DIVERT was developed to evaluate levels of risk for home care clients visiting an ED but without considering means of transportation to the ED. The DIVERT scores presented for this cohort overall are relatively similar to previous findings (2), with the largest number of clients having a score of 2 and the fewest having a score of 6. Other variables reflecting social factors were tested that could have an association with access to other means of transportation that may influence a patient's decision to call emergency services. Inclusion of these variables in the model building process did not improve the results achieved from DIVERT scores alone.

One of the challenges associated with case-finding tools is with respect to the differences between the sexes. The findings of the Paramedics assessing Elders at Risk for Independence Loss (PERIL) Study indicated that identification of male patients was significant as it related to adverse outcomes.(13) Known characteristics about male mortality suggest that gender differences are likely. We found that males had statistically significant odds for use of an ambulance within 90 days of home care assessment. Similarly, increased odds were noted for age and decreased odds for those that lived with a carer. We suspect that female clients who live with a carer are less likely to use paramedic services than male clients or those who do not live with a carer. However, exploring our assumption by investigating the independent variables at our disposal and any interactions between these terms, did not improve model performance beyond the most modest levels.

Future work can look at the association between temporal factors and subsequent ED utilization. For example, those that used an ambulance to get to the ED had an average time of use following assessment of less than a month (29.31 days) compared to almost four months (119.09 days) for those that did not use an ambulance. Survival analysis could provide further insight into these differences with a goal of tailoring provision of care to a "just-in-time" model. Forecasting use of emergency services involves considering their stochastic nature. Our investigation focused on information that may be available pre-emptively through the standardized RAI-HC assessment instrument. For that reason, we did not include information regarding the nature of ED visits such as acuity level or time of visit. Others have noted the relevance of off-hours use (defined as outside of regular business hours of Monday to Friday between 9:00am and 5:00pm) as informative with respect to patient profiles.(17,18) Investigation of our dataset revealed that time of use may be worthy of further exploration as more clients used paramedic services outside of regular business hours than within regular business hours.

The results indicate that consideration of DIVERT scores could be a valuable risk assessment tool for paramedics to use with community dwelling older adults. The discriminatory performance of our logistic regression model demonstrated that it would be feasible to classify all patients with a DIVERT score of 4 or greater as being likely to use an ambulance. Using our cohort as an example would mean that 9,826 patients would receive this prediction. Further study is required to explore the utility of such a classification, to investigate actual utilization by pre-identified patients, and to consider preventative interventions.

One of the limitations of using administrative data is that we cannot comment on whether social factors such as living arrangement or living in a rural location were influential at the time of paramedic service use. Further investigation of these social factors and consideration of aspects of social isolation and carer resiliency as they influence the use of paramedic services is warranted.

Conclusion

The DIVERT scale is used to identify home care clients at greatest risk for using the ED. The results from our investigation of indicators of paramedic service use by community dwelling older adults demonstrates that the DIVERT Scale is suitable for identifying clients likely to use an ambulance provided by paramedic services for transport to the ED within 90 days. Future work needs to identify interventions that are suitable for addressing the needs of these clients and exact clinical situations of use.

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RESEARCH ARTICLE

PARAMEDIC TRANSITION INTO AN ACADEMIC ROLE IN UNIVERSITIES: A QUALITATIVE SURVEY OF PARAMEDIC ACADEMICS IN AUSTRALIA AND NEW ZEALAND.**Graham G. Munro** MHSM PhD(c)^{1*}, **Peter O'Meara** PhD², **Bernice Mathisen** PhD³[*graham.munro@acu.edu.au](mailto:graham.munro@acu.edu.au) OPEN ACCESS ARTICLE

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Abstract

Healthcare professionals who transition into academic roles in universities are confronted with many challenges. Universities offering paramedicine degree programs struggle to find qualified paramedics to assume academic roles, while at the same time little is known about the issues that confront paramedics transitioning into academic roles in universities. A maximal variation sampling method was used to interview 16 paramedic academics in Australia and New Zealand and a thematic analysis was conducted that generated a thematic network that encompassed five areas: the community of practice of paramedicine, the community of practice of academia, entry into a new community of practice, professional identity, and expectations and challenges. The resulting analysis revealed that new paramedic academics transitioning to academic roles in universities are often under-qualified and underprepared for academic positions. The induction and mentoring processes are often ad hoc and ineffective leaving the new academics feeling isolated and disillusioned. They struggle with establishing or maintaining a professional identity and meeting university expectations related to teaching, research, acquiring a PhD, and publication. Both these communities of practice need to engage in the development and preparation of these new academics so that paramedics will be attracted to these new roles and their transition to academia is a positive process.

Keywords: Community of practice; academic; induction; mentoring; transition; professional identity

Introduction

The experiences of professionals making the transition from their original community of practice (CoP) to the community of practice of academia are well-documented in fields such as nursing, teaching, and allied health.(1-12) However, little is known about the experiences of paramedics transitioning into academic roles in universities.(13) The literature related to the experience of nurses and teachers transitioning into academia has revealed several issues. MacIntosh asserts that new nursing academics receive little to no education or preparation on how to become an academic and is generally received after entering the academy.(9) Gourlay (14) challenges three of the concepts of Communities of Practice (CoP)(15), which are a shared repertoire, mutual endeavour, and expert-novice interaction. Gourlay suggests that for shared repertoire, there is no exchange of information on how things are done, you are basically on your own. For mutual endeavour, there is no sense of teamwork leading to a sense of isolation. This involved not only practices but underpinning values and ideologies. For expert-novice interaction, there was a lack of focused, formal mentoring or direction. The transition or induction process was described with experiences of confusion, inauthenticity, and isolation.

Martinez examined the experiences of teachers transitioning from teaching in schools to becoming educators in universities.(10) The major issues that were identified for teachers might be similar for paramedics and other healthcare professionals. **Autonomy:** the transition from a highly-regulated workplace to one of individual responsibility and self-reliance. **Institutional Size and Structure:** a transition to a larger organization with a different management structure and culture – establishing new social and professional networks as well as sorting out new workplace professional responsibilities. **Work Environment, including technology:** transition to having an office, own computer, access to internet, – productivity and time pressures. **The Modelling Imperative:** the pressure associated with “practicing what you preach” with regards to the delivery of education to students – pressure of student evaluations for promotion and the production of research and publication output. **Research and Promotion Culture:** this is a whole new paradigm for most paramedic professionals entering academia. Their previous experience with research is usually minimal or non-existent and the drive to meet quantitative measures of success to maintain their positions is a new challenge. Teachers are reported to have entered academia with a sense of inferiority and a lack of confidence and research and teaching experience.

A study by Girod and Albarran examined the risks to the academic workforce in 10 allied healthcare disciplines, including paramedicine, in the UK.(5) This study looked at how the age distribution of staff, the number of academic vacancies, and the qualifications of staff affected the quality of the work experience for the academics and profiled that, outside of nursing and midwifery, the number of working academics with doctoral qualifications was very small. The authors were interested in finding out if paramedic academics in Australia and New Zealand were experiencing challenges and conditions similar to those of teachers, nurses, and other allied health professions.

The impetus for this study was based upon the first author’s experience of transitioning from the CoP of paramedicine in Canada after 30 years to the CoP of academia in Australia. The transition period and process was fraught with challenges and obstacles and it is important to examine the experience of others paramedics making the same transition to academia. This study explores this knowledge gap.

The authors explore and evaluate the themes and issues identified through a series of semi-structured interviews with paramedic academics in Australia and New Zealand. An analysis of those interviews and practical recommendations for improving the experience of paramedics transitioning into the community of practice of academia are provided.

Design and methods

The methodology employed in this study is that of qualitative content analysis (QCA), which is situated within the broader area of narrative research. Narrative-led research is seen as a term that encompasses inquiry; that seeks to situate the lived social experiences of individuals into a space of inquiry that is three dimensional: temporal, personal/existential, and place(16, 17). This approach is most often seen by researchers as a flexible way of analysing verbal or text data, such as interview transcripts.(18, 19)

Within this domain is the methodology of interpretive description.(20) This methodology was used because it allowed for exploration and analysis of the data without the restrictions of the traditional qualitative methodologies, while maintaining requisite validity and rigour.

Sample

Maximal variation sampling (21) was used to recruit 16 paramedic academics teaching into paramedicine degree programs in Australia and New Zealand. This method was used to obtain the widest possible cross-section of paramedic academics in relation to gender, age, country of origin, qualifications, and years of experience.

Ethical Aspects

This study received ethics approval from the La Trobe University, University Human Ethics Committee Approval No: FHEC13/088. The demographic data were reported as de-identified profiles. Aliases were used for the quotes from participants. However, it is acknowledged that within this relatively small community of practice, people may be identifiable. Therefore, all efforts were made to provide as much de-identification of data as possible.

Data analysis

Directed Content Analysis

A process known as directed content analysis (DCA) was used to establish pre-determined codes that directed the content of the questions used in the interviews(22). This process is used when the data are collected primarily through interviews. The questioning starts with open-ended questions that are then followed by targeted questions based on the predetermined codes.

Sixteen interviews were conducted by the first author over a three-month period in 2013. Eight were conducted over a two-day period at a professional conference and eight were conducted over the next two months at three university campuses where the participants worked. All participants were given an information statement and then signed a consent form that ensured confidentiality of information and data. A semi-structured interview process was used in which several key questions were asked of all participants that focused on obtaining information about their experiences within ten higher codes listed in Box 1. Opportunities for further exploration of ideas or content were explored through the use of open-ended, leading, and verifying questions. This provided richness to the responses and opened up new areas of discussion and analysis.

- | | |
|------------------------|--------------------------------------|
| • Academia | • Professional identity |
| • Challenges | • Recruitment |
| • Induction | • Research |
| • Mentoring | • Teaching |
| • Paramedic Experience | • Transition from Paramedic Practice |

Box 1: Ten Higher Codes

The interviews were conducted and digitally recorded and professionally transcribed. The interviews lasted between 14 minutes and 62 minutes with a mean average of 35 minutes. A manual thematic analysis was conducted as well as the use of the Leximancer© software program to generate organising themes.

The areas of inquiry were formulated based on a review of the literature from other disciplines and from professional observations and experiences. This provided structure to the research process and insight into the experiences of those within the CoP of paramedicine.

Each of the participants’ transcripts were read multiple times and quotes were obtained that fitted into each of the higher codes. Each of these codes, also known as Basic Themes, were then placed within one of five Organizing Themes.(23) These organizing themes were: CoP of Paramedicine, CoP of Academia, Entry to a New CoP,

Expectations and Challenges, and Professional Identity (see Figure 1).

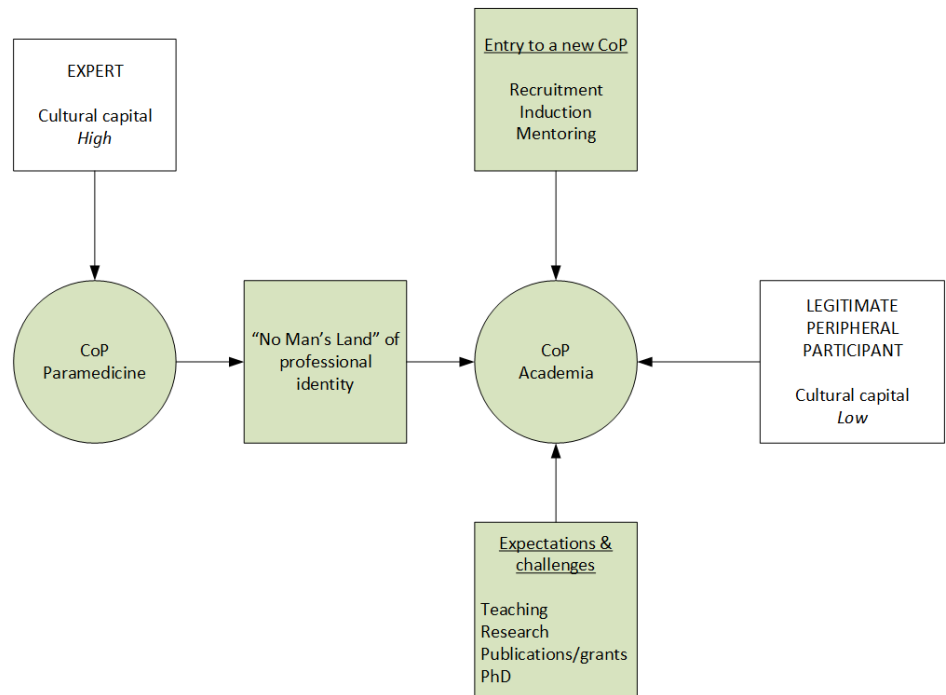


Figure 1: Structure of the thematic network

Discussion

An analysis of the participants' responses revealed many of the same issues and challenges that other health and education professionals have experienced in making the transition from professional practice to academia.

CoP of Paramedicine

An issue that is pervasive throughout the CoP of paramedicine is that paramedics have a difficult time defining just what their CoP is. A literature search of databases found no articles that addressed the CoP of paramedicine. In many discussions and interactions with paramedics in Australia, Canada, and the U.S.A., the prevailing theme seems to be one of having difficulty in separating the profession of paramedicine from ambulance services. The vast majority equate paramedicine with being a clinical practitioner in ambulance services and do not see their profession as existing outside of ambulance services. In the UK, paramedics are registered health professionals, have entry-level university education, and work in a wider range of settings. This is reflected in the College of Paramedics career structure that recognises paramedics practicing in four domains; clinical, management, education, and research. Paramedics practicing in these four domains can maintain their registration and continue to be recognised as valuable members of their CoP.(24) Starting on September 03, 2018, paramedics in Australia will become registered healthcare practitioners under the Australian Health Practitioner Regulation Agency (AHPRA).(25) A similar structure exists within other allied health professions, such as nursing.(26)

There exists a wide diversity in levels of qualification and training among paramedics in Australia and New Zealand and in the way that out-of-hospital care is delivered. Most states utilise a multi-level system of service provision that encompasses minimally-trained volunteers to highly-qualified critical care retrieval paramedics within the provision of emergency services.(27, 28) In addition, the emergence of community care and extended care paramedics within the non-emergency side of service delivery has created communities of practice within the broader CoP of Paramedicine.(29)

The participants responses revealed the vast majority of paramedics teaching into degree programs in Australia and New Zealand received their clinical training and qualifications within vocationally- based programs. This has been particularly prevalent

among the paramedics who were trained and gained their experience in North America, where tertiary education was not and is still not widely available for entry-level paramedic qualifications. The capital (social and professional assets), and the developed habitus (identity) that are acquired by the participants within the CoP of Paramedicine, does not appear to be easily transferred into the CoP of Academia and forces the new academics to begin acquiring their academic capital and habitus as legitimate peripheral participants (LPP) (novices), of the CoP of Academia.

CoP Academia

Many of the universities in Australia and New Zealand that offer paramedicine programs adhere to a traditional construct of the triad of the academic: teaching, research, and publication. Although all of the participants who were interviewed had some background in teaching (mostly vocational), they had very limited experience in research and publication and this hampered their ability to meet relatively rigid job qualifications. In the vast majority of position postings, a doctorate or near completion of a PhD is a standard requirement for a comparatively low-level lecturer position. In addition, the lack of a PhD is a considerable obstacle to advancement or promotion within the universities. (30-32) In addition, interviewees expressed feelings of inadequacy and the lack of a defined identity as an academic because they had not yet attained the academic status associated with having a PhD.

A common thread through the interviews and from subsequent conversations with paramedics interested in entering academia, is the perception that academic roles in paramedicine programs entail mostly teaching. When confronted with the prospect or expectation of engaging in research and publication, there is little enthusiasm and a reluctance to embrace these key components of a traditional academic role. Many who are already in these roles find the expectation of research and publishing daunting and struggle to fulfil these demands while often struggling to meet very high teaching loads. With the decrease in government funding for universities, there is increasing pressure being placed on academics to increase their publication rates and to bring in external funding in the form of research grants.(33, 34) As most paramedics are entering academic positions without a PhD and limited experience in research and publishing, they are not contributing to the revenue streams of the university. On average it takes seven years before a new academic is awarded their PhD or professional doctorate.(35) With the ever-expanding number of paramedic degree programs in Australia and New Zealand, there is an increasing demand for academically-qualified paramedics to fill academic positions. The traditional academic triad, plus the demand for doctoral qualifications, is limiting the number of paramedics who can meet the standards for employment and this results in unfilled vacancies. As a result, some universities are offering teaching only or teaching-dominant academic positions, to meet the demand (36, 37) along with the use of practicing paramedics to fill sessional or tutorial positions.

One of the issues that a large percentage of the participants identified was their perception or conception of academia and how they formulated it. In the study by Munro, O'Meara and Kenny (38) it was identified that 37% (n=11) of paramedic academics had completed their university education by distance learning and had formulated their idea of what academia was about without setting foot inside a university classroom. Their perceptions might have been constructed from this experience combined with films, television and other media.

So I think what I missed is, and still to this day, I miss being a university student on a traditional campus. But it is what it is ... so my first experience as I said was traditionally ninety percent online and, in fact, all of my university life has been in that mode except for my PhD. (Robert)

Entry to a New Community of Practice (CoP) (Recruitment, Induction, Mentoring)

Lave and Wenger (15) call new entrants into a CoP legitimate peripheral participants (LPP). These new participants are more than apprentices. They are inducted into their new CoP by formal means, while benefiting from the informal acquisition of values, language, and rituals that are absorbed by the LPPs without the use of formal means of learning and teaching. Both of these processes require some structure that directs the

formal induction of the new academic to the policies, procedures, and processes of the university and the more informal mentoring process that assists the new academic to navigate their way through the tacit values, language, and rituals of their new CoP. Often, the informal socialisation processes can be more powerful and influential than the traditional induction programs seen in many organisations.(39)

The participants in this study revealed a widely divergent experience with regard to the processes of recruitment, induction, and mentoring at the universities where they were employed in Australia and New Zealand. The consensus was that these three components of their entry into their new CoP of Academia were poorly implemented, with the induction and mentoring phases being considered to be informal, unorganised, and at times, counterproductive and demoralising. As mentioned earlier, studies over the past decade or more, regarding the quality and effectiveness of these processes within universities in Australia, New Zealand and elsewhere, have shown that little has changed and this study reinforces those claims. There is strong evidence that the quality of the mentor/mentee relationship is the key to a successful transition from one CoP to another. (40-43) The challenge to universities is to recognise the importance of these processes and to make concerted efforts to change the ways that they approach and implement recruitment, induction and mentoring programs.

The session was over the phone. You know here is a position are you interested, yes okay you start Monday, nothing more nothing less. The role was as advertised and I formally interviewed, was referee checked and the like. (Robert)

(John) pretty much took me around and showed me where everything was. I was in a different office to begin with because this office wasn't ready and I was given a laptop initially and I was pretty much left to my own devices for a lot of it which was really, really rude for me because I had never done anything like this. So I really had no clue where to start with it and so it was like ... Yeah kind of jumping in at the deep end. (Milley)

They have some orientation courses that they offer so I have been to those. It's face to face, but they are fairly superficial and they are not directed necessarily at the academic staff. (Mike)

Expectations and Challenges (Teaching, Research, Publication, PhD)

New academics and the universities are faced with their own sets of expectations and challenges that relate to teaching, research, publication, and the completion of a PhD. The universities have an expectation that the new academic is well-trained and experienced in teaching methods and philosophies of teaching and can basically 'hit the ground running' when they commence their new positions. For the majority of the participants interviewed, their teaching experience was restricted to the vocational sector and ranged from teaching in first aid and basic level paramedic programs to more advanced levels of paramedic practice. An issue for many of these vocationally-based teachers is that we tend to teach the way we were taught.(44) This poses a challenge to the new academic to rapidly change their pedagogical approaches to teaching and for the universities to provide professional development in methods of university learning and teaching. While this development of new academics in tertiary pedagogies is ongoing, the same cannot be said for their education and development in research.

The participants expressed concerns about the expectations of the universities regarding their ability and willingness to engage in research. There were no formal education programs in research reported, as there were in learning and teaching. They were expected to find research mentors to assist them with their learning and participation in research. Many of these mentors, if they existed, had various levels of knowledge and commitment to the task.

There is a concern that middle and senior managers within the universities are ill-informed about the profession of paramedicine and the lack of academically qualified paramedics to take on the traditional academic roles within the programs. As of August 2016, it was estimated that there are approximately 30 paramedics in Australia and New Zealand with doctoral qualifications and around 60 paramedics and paramedic academics

enrolled in higher-degree research programs (personal communication P. O'Meara).

Considering that this process of completing a doctorate can take the new academic an average of seven years (35), this poses an issue for the universities with regard to a substantial period of non-productivity from these academics in the areas of research and publication. Not all of these present and future doctoral-qualified paramedics are interested in engaging in fulltime academic appointments, many preferring to split their time between part-time academic duties and maintaining their qualifications in clinical positions in ambulance services. Their major reason for not wanting to take on a fulltime academic load was their reluctance to engage in research and a desire to remain connected to their profession. This connection to two communities of practice is described by Wenger(45) as brokering, specifically multi-membership, in which the individual has involvement or membership in more than one CoP.

They focused on teaching the instructing part. But they also made it pretty clear that they were expecting me to do research, to get a PhD, supervise research students and be a researcher. And a big part of the sell that they did was the support that I would get for that. (Tony)

... and so I, I knew a little bit about it but to be honest then the workload just hit at the University and the idea of research was just out the window. (Kevin)

You guys know until we start publishing, which is how the University makes its money, we are expendable and until we start publishing we are not a professional faculty. So this is a university and if we are not publishing we are going to perish. (Mike)

I think again it might have been mentioned it was probably something that I would have had in my mind but wouldn't have even known really what a PhD was about let alone my topic. (Robert)

So it was you know I was met by someone from the team who talked about research who was the research person and how it would be great to do a PhD that was foreign to me. I thought about leaving at that point to be honest with you. (Ralph)

Professional Identity

Professional identities are constructed and developed within the structure of a community of practice.(15) When new members of a profession enter their new CoP, they are inducted or professionally socialised into the rules, values and rituals of the CoP. Over time, the individual acquires their professional identity based on their own engagement with the formal standards, values, and principles of that CoP along with the tacit and undocumented values and rituals that exist. For many individuals who are part of the profession of paramedicine, these professional identities are strongly held and can be integral to their sense of being and self-worth.

A major theme that evolved from these interviews was the aspect of a loss of professional identity for these new or already established academics. They revealed that, for most of them, they no longer considered themselves to be paramedics because they were no longer treating patients. When asked if they considered themselves to be academics, the majority stated that they did not because they did not have a PhD, which appeared to them to be a fundamental benchmark of being an academic. This has placed them in a position that the authors have labelled the 'No Man's Land' of professional identity.(46) They are in a new CoP, existing on the periphery, without the qualifications or academic capital that would entitle them to advance on an inward trajectory toward acceptance as a centripetal member of the academic CoP. This lack of acceptance by their peers, their lack of a constructed and accepted academic identity, or both has created high-stress work environments and has caused many to question whether they should remain in academia, pursue modified positions within the university, or return to clinical paramedicine. Munro, O'Meara and Mathisen (46) explore and expand on this struggle to maintain a professional identity in more depth.

The responses from a majority of the participants indicated that they were confused and uncertain of their own professional identity.

...a typical academic to me that you know whenever you're talking to them always seems to be able to quote this one and that one. And they talk about writing papers and publishing and all of that sort of stuff. But I don't know really. I suppose I have never really given much thought to it. (Milley)

Q: Do you still consider yourself to be a paramedic?

Yes by way of training, but now that I know that I am not practising and that is kind of hard. (Milley)

Not at the moment no. No unless you are actually treating patients I don't know. No which is weird yeah. (Kevin)

Q: Do you consider yourself to be an academic?

God no; absolutely not. (Milley)

No, absolutely and still don't today consider myself an academic. (Ralph)

Conclusion

The transition from the community of practice (CoP) of paramedicine to the CoP of academia is one that is challenging, and often disheartening. Their experiences are not unlike those that are reported in the nursing, allied health, and teaching literature. Some aspects, however, appear to be unique to paramedicine.

Paramedics struggle to define what constitutes their community of practice with little to no literature on this subject. The profession is in its relative infancy compared with other more established professions, such as medicine and nursing, which have more clearly defined roles, values, and rituals. Social capital developed in paramedicine is often not easily transferable into academia which, in many universities, still adhere to a traditional academic paradigm that many new paramedic academics struggle to meet. Expectations on both sides are often ill-informed and unrealistic, based on a lack of knowledge and understanding of each other's CoP.

After decades of study about the inadequacies of induction and mentoring programs in universities, there is still a lack of effective and focused programs to meet the needs of the new paramedic academics once they commence their roles. The prevailing attitude among the new academics is one of being left to their own devices; to quickly acclimatise themselves to the culture and processes of their university, one often expressed as being, 'thrown off the end of the dock and being expected to swim'.

One aspect of this study was that of the loss of professional identity by many of the new paramedic academics. It was expressed that the need to be actively working in clinical paramedicine, the need to be treating patients, was an integral part of their professional identity that was lost or greatly reduced once entering academia. In contrast, their lack of an academic professional identity was strongly rooted to the absence of a doctoral degree, and a record of research and publication, thus leaving them in a 'no man's land' of professional identity. This created feelings of inadequacy, high levels of stress, and desires to take on positions that were more teaching focused.

The employers of paramedics need to provide its members with more opportunities to engage in professional development activities that better prepare potential academics for roles in universities. These activities include, modified shift schedules that allow for academic study, opportunities for joint appointments in university programs, and more collaborative research projects between academics and paramedic professionals. The universities need to educate themselves about the demographics of the CoP of paramedicine and have more integrative induction and mentoring programs to assist the new academics with the transition into academia, which for many is a daunting and often confusing process.

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RESEARCH ARTICLE

**PARAMEDIC STUDENTS WORKING IN SNOW RESORT
MEDICAL CLINICS: A NON-TRADITIONAL
INTERPROFESSIONAL CLINICAL PLACEMENT MODEL****Anthony Scott Devenish** PhD^{1*}, **Glenn McKay** MBChB BSc², **David Nicholas Long** PhD¹, **Peter David Horrocks** MHLthSc BN¹, **Michael Smith** BHSc³*scott.devenish@gut.edu.au OPEN ACCESS ARTICLE

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Abstract

This study investigates the experiences of undergraduate paramedic students completing interprofessional clinical placements in snow sport injury clinics. Qualitative methods were used to investigate the experiences of participants (n=6) undertaking non-traditional ambulance clinical placements as part of a multidisciplinary healthcare team. Ethical approval was obtained through Queensland University of Technology, Brisbane Australia. Data were collected via individual face-to-face interviews and analysed using holistic and focused coding. The analysed results indicated the presence of three main categories, namely Pre-Placement, Intra-Placement and Post-Placement phases. As it was a new placement, student capabilities were not initially known by clinic staff. Nevertheless the workplace culture was inclusive and supportive, and paramedic skills were applicable in the clinic environment. Despite the placement costs being excessive, participants viewed it as an investment in their future careers. Benefits of the placement included perceived improvement in maturity levels, the acquisition of professional networks, an understanding of interprofessional practice and an exposure to clinical skills not normally practiced during traditional ambulance placements. The interprofessional clinical placement appears to be a valid alternative to traditional ambulance placements. However, using this model to replace mainstream placements is problematic due to the costs involved, the limited number of spots available and the seasonal occurrence of snow sports.

Keywords: alpine; interprofessional; paramedic; placement; qualitative; student

Introduction

Historically, clinical placements for Australian university paramedic students have occurred almost exclusively within state-based ambulance services. With the growth in paramedic student numbers and the introduction of new university-based paramedic programs, competition for clinical placements is unprecedented.(1) Subsequently, the Australasian peak industry body, the Council of Ambulance Authorities (CAA) recently endorsed clinical placement guidelines stipulating 600 hours of placement are required for university paramedic program accreditation.(2) The 600 hours include 300 hours minimum with a state-based emergency ambulance service and 300 hours maximum in an alternative area such as placements with international ambulance services, private ambulance providers, hospitals, medical clinics and aged care facilities. Clinical simulation can also be counted in the alternative placement hours up to a maximum of 100 hours.(2) Whether the Australian Health Practitioner Agency (AHPRA) adopts these guidelines is yet to be confirmed. Nevertheless due to placements being at capacity it is critical to expand clinical placement opportunities and explore alternative placement options.

Other health professional groups have been required to manage similar challenges. For example, in professions such as occupational therapy and physiotherapy, clinical placements can occur in a range of non-traditional settings, where the principal supervision of the placement comes from a health professional that is from a different health discipline to that of the student.(3-5) In effect, the clinical placement is managed through an interprofessional learning (IPL) approach as part of a multidisciplinary team.

In this study we used qualitative methods to evaluate paramedic students' experiences in an interprofessional snow resort medical clinic. Each interprofessional team consisted of an emergency doctor, emergency nurse, physiotherapist, medical student, two paramedic students and alpine ski patrol. Thus the paramedic student received their day-to-day supervision from health professionals other than a paramedic. The peer-reviewed literature about paramedic placements in a non-ambulance environment is limited. Studies were found investigating perceptions of paramedic students undertaking volunteer community placements.(6) Other research focuses on placements in nursing homes or dementia clinics.(7, 8) Research also exists, examining interprofessional paramedic placements in aged care facilities (9) and rural locations.(10) However, apart from a study examining the measurement properties of the Interprofessional Education Perception Scale (IEPS) in paramedic education, (11) research evaluating the effectiveness and quality of non-traditional university paramedic placements is limited in the peer-reviewed literature.(12)

No published peer-reviewed research was found focusing on non-traditional undergraduate paramedic student placements in an alpine ski environment, where supervision is provided by a health professional other than a paramedic. Thus this study provides a unique perspective about the experiences of paramedic students working with nurses, physiotherapists, emergency physicians, medical students and alpine ski patrol in an international multi-disciplinary clinic environment.

Methods

The aim of this study was to identify the experiences of undergraduate students undertaking an international clinical placement in an interprofessional snow resort medical clinic. Final year paramedic students from Queensland University of Technology (QUT), Brisbane, Australia were chosen to take part in the clinical placement with Medical Rescue. Students were invited by email to participate in the study. The email included a participant information document and consent form. Six students volunteered to participate in face-to-face semi-structured interviews after the completion of the placement.

Interviews, which lasted for approximately 45 to 60 minutes in length, were conducted at a pre-arranged time in a mutually agreed location, such as a café or library meeting room. Interviews were digitally recorded, and transcribed by a professional service. The data were analysed using qualitative content analysis.(13) Holistic coding (14-16) was used followed by code contestation.(13) Codes were then sorted into categories, concepts and themes and organised using focused coding.(14-16)

Ethics

Ethical clearance was sought and approved through the QUT Human Research Ethics Committee (Ethics clearance number: 1700000365). Participants signed a consent form prior to taking part in the study. Data cleaning took place to de-identify the students and maintain participant anonymity. Data were stored as per QUT policy. Research approval was obtained from Medical Rescue, which also contributed to the design and conduct of this study.

Results

Three categories became evident during the data analysis (Figure 1). First, the Pre-Placement Phase examined the experiences and preconception of students prior to their arrival in New Zealand. Second, the Intra-Placement Phase explored the experiences of students as their placement progressed in Medical Rescue ski injury clinics. Last, the Post-Placement Phase investigated student reflections about the placement after returning to Australia.

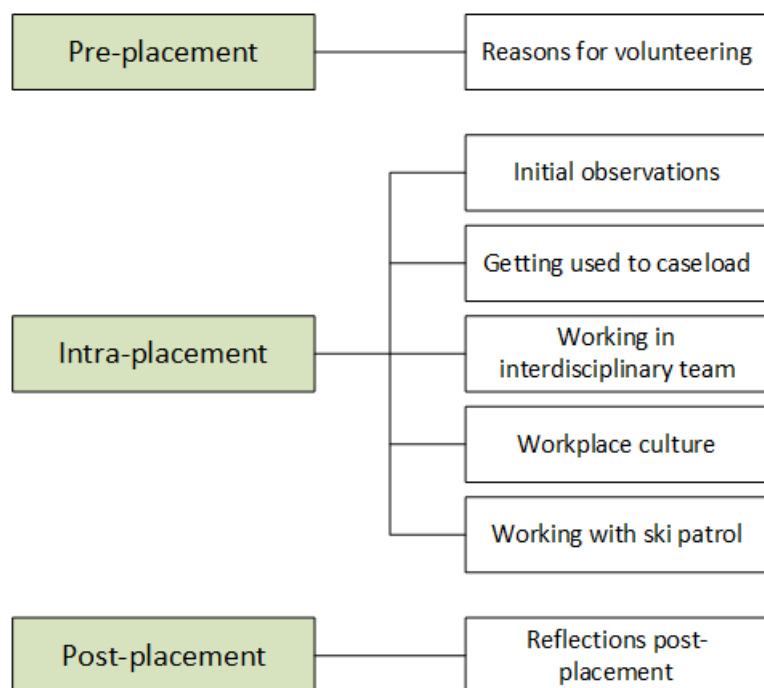


Figure 1. Categories established through holistic and focused coding (14-16), and qualitative content analysis of the data.(13)

Pre-Placement Phase

The Pre-Placement Phase examined the preconceptions and reasons why students volunteered for the clinical placement in the New Zealand ski resort clinics operated by Medical Rescue. The codes identified in the analysis of this phase are outlined in Figure 2. The desire to participate in snow sports and a perceived challenging clinical environment were the main drawcards. Additionally, being enamoured with ski patrol, and having a goal of working on the ski slopes in a medical capacity were reasons why students volunteered for this placement opportunity. Thus the Medical Rescue clinical placement combined an interest in ski patrol with university clinical placements. Working in an interprofessional team also enticed students to undertake the placement. The potential to work with emergency physicians and physiotherapists in a clinic, where the caseload was mainly trauma, was viewed as being an exciting challenge. Students were interested in making networks with a private paramedic providers, representing their university internationally, and completing a non-traditional placement with a view to making their application stand out from other students who did not get the same opportunity.

The large numbers of paramedic students in Australasia (1) were of concern to the

participants, and the Medical Rescue placement was seen as an opportunity to improve their job prospects with an alternative employer other than a state-based ambulance service:

“You don’t know where you’re going to get hired and if you’re going to get a job. I thought it’s good to look at all the different options that are available, that we could branch off into ... what other things could I potentially do and would I be able to get involved in that in the future?”

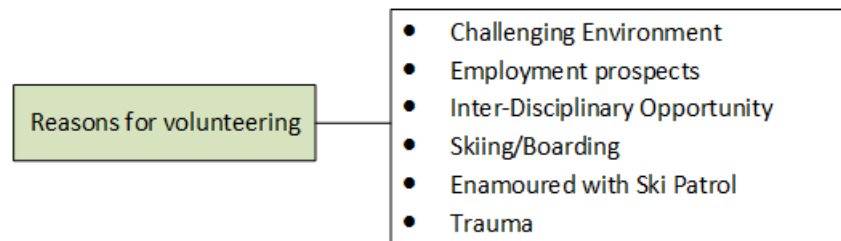


Figure 2. Pre-Placement codes established through holistic and focused coding (14-16), and qualitative content analysis of the data.(13)

Intra-Placement Phase

The Intra-Placement Phase encompasses the orientation prior to the opening of the clinics, and the process of learning and assimilating into a clinic environment throughout the placement. The codes established from the data analysis of the Intra-Placement Phase are highlighted in Figure 3. Of initial surprise were the challenges of becoming accustomed to the dynamics of working in transitional or seasonal ski injury clinics. Students, being used to traditional ambulance placements, were unprepared for a team of health professionals who had not necessarily worked together before, and did not know each other’s’ capabilities:

“Before the clinic opened people weren’t familiar with where things were, there was a new computer system, and the crew hadn’t worked with each other before. So we didn’t know who had what skills, who had done what ... whereas coming from an ambulance placement, everybody in that ambulance knows where equipment is and what they have and what they don’t have ... after the first couple of days it actually picked up and turned around ... there was a good support network ...”

The excitement of working at a ski resort was evident as students reported the experience to be surreal. The following participant had possibly spent holidays at the snow, and found working in the clinic and roaming the mountain with ski patrol to be surreal:

“The first couple of days after (the resort) opening, I couldn’t believe I was working on a ski field ... I’d strap on the snowboard and go for a run ... be seen on the runs and interact with the ski patrollers. It’s like this isn’t a job. This is amazing.”

Despite the initial lack of cohesion, student were made to feel part of the team, which for some was different to normal ambulance clinical placements, where they are visitors to the workplace, and not an integral part of the team. Despite a subtle clinical hierarchy, where the emergency physician was in charge of the clinic, students were surprised to be afforded acceptance into the team compared to their experiences on traditional ambulance placements:

“I mean there was an obvious clinical hierarchy, but we were all inclusive in that clinical interprofessional team for sure. I felt it was in some way better (than a traditional placement) because you haven’t got those paramedic mentors that think they’re God’s gift to earth and don’t want to look at you because you’re a measly student.”

It took a little while for participants to engage in learning activities associated with the placement. Students realised they had to approach the clinic staff and ask for opportunities, as the clinic staff had never worked with paramedic students before and did not know their capabilities. Furthermore, apart from ski patrol, clinic staff were working at the snow for various reasons such as a working holiday or to participate in snow sports. On occasions some staff did not go out of their way to involve students. Despite the initial teething process, students found they had more autonomy compared to a traditional ambulance clinical placement, as they had their own clinical practice guidelines to follow, which were developed by the Medical Rescue Medical Director. Students assisted with the initial triage, assessment and then referral to clinic staff, and were engaged in the management of a patient load.

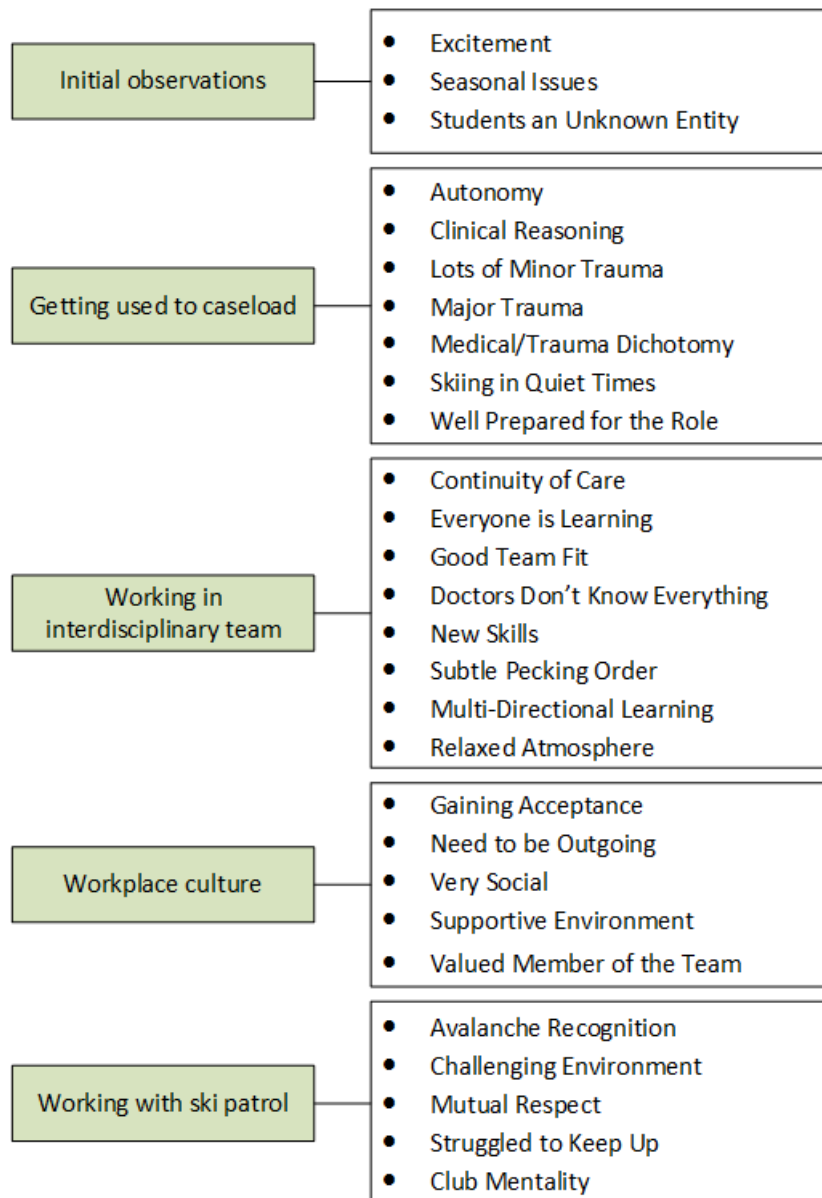


Figure 3. Intra-placement codes established through holistic and focused coding (14-16), and qualitative content analysis of the data. (13)

Despite the caseload being mostly minor trauma such as fractures, dislocations and torn ligaments, the occasional major trauma case occurred. Students found their university studies prepared them to manage major trauma, and were afforded greater respect by the clinical staff after proving their ability under stress:

“The (major trauma) cases certainly drove home how significant traumatic injuries can be up there ... Just seeing the team working together on a really critical patient demonstrates everyone’s skills, where everyone was supporting each other and they were very confident in their decisions ... Up until that point, we were all quite unsure about each other’s capabilities. The (doctor) was really impressed with our abilities, and our confidence and how calm and collected we were through it.”

Due to the location of the snow resorts, and the proximity of Queenstown to major trauma facilities, evacuating severe trauma cases required helicopter retrieval. Students spoke of their fascination observing emergency physicians and flight paramedics discussing the management of the patient and problem solving to provide high level care in a remote and challenging environment. Students learned that Emergency Doctors did not know everything and were challenged by the alpine environment. Furthermore, doctors often referred to other members of the interprofessional team when making diagnostic decisions. For example, students were impressed to see doctors refer to physiotherapists for an opinion about shoulder or knee injury. It provided students with an understanding of how multi-disciplinary teams operate. For example:

“It’s been very valuable working in an interprofessional team ... a lot of students don’t get to experience an interprofessional team in action ... it has opened my eyes to the opportunities of working in a medical facility and not being on-road, for sure.”

Learning in the clinic was not all unidirectional. That is to say, the interprofessional team learned from the students, especially when it came to patient packaging and the use of equipment such as femur traction splints, the use of cardiac monitors and cervical collar application. Being comfortable with this equipment appeared to improve the clinic staffs’ confidence in the students’ abilities.

Interaction with ski patrol was also an important component of the placement. Students often wished they approached ski patrol earlier in their placement to accompany them on mountain ‘sweeps’. Not being able to keep up with the patrollers appears to be the main reason why participants did not participate in sweeps earlier in their placement. After several weeks at the snow, students further developed their skiing or boarding proficiency, and thus obtained the confidence to accompany ski patrol. Valuable learning was obtained from observing and working with ski patrollers in relation to patient packaging, difficult extrication and managing a patient while standing on icy or an unstable surface.

Students spoke of a mutual respect between themselves and ski patrol possibly due to the type of cases they went to. Despite this mutual respect, students identified that at some resorts, ski patrol had their distinct culture compared to the other clinic staff. Students, during down time, were able to shadow ski patrol, and got to experience the challenges with providing trauma management to patients in the alpine setting:

“We went out and did a little bit of work with them. I did an instruction period with them ... attended cases on the mountain and sweeps at the end of the day when we were clearing the mounting. I got to understand a bit about hypothermia and the targets that we’re looking for with patients that are caught in an avalanche. That’s something I never would have learnt about otherwise. So that was really awesome.”

Overall, the workplace culture present in the ski resort medical clinic was different to the traditional paramedic setting. Students observed the workplace to be inclusive and trusting, not a paramilitary culture such as that found in ambulance services.(17-19) There was also a vibrant social life, which further led to team bonding and inclusion.

Post-Placement Phase

After the completion of the seven week clinical placement, students were able to reflect on their experiences in the Post Placement Phase (Figure 4).

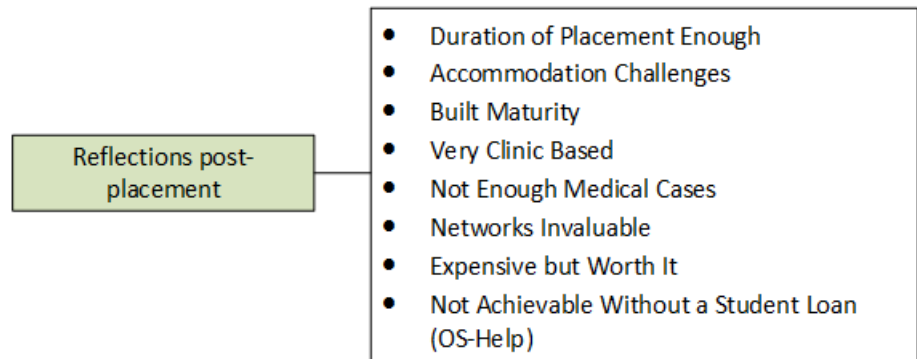


Figure 4. Post-Placement codes established through holistic and focused coding (14-16), and qualitative content analysis of the data. (13)

Participants believed the length of the placement was enough, as any more than seven weeks away from their friends and family would have been difficult. Due to the length of the placement, the cost of living in Queenstown was an issue for some, as well as having to find accommodation during the ski season. Despite the costs, students viewed the expenditure as an investment in their future career, which possibly opened up employment opportunities in the private paramedic sector. It also developed their professional networks with clinic staff. For example:

“I still keep in contact with the team. We’re still messaging each other ... Importantly it gave me some networks ... people that I can talk to who are doctors, physios and nurses ... So that’s really good for me and adds exposure to what I think my paramedic career is going to be.”

Participants felt that undertaking an international placement enabled them to build maturity which would assist them to transition to the workplace:

“I think it made us grow up a little bit. You’re suddenly in a different country, you’re living overseas, (and) you’ve got different priorities.”

Of interest was a dichotomy between medical and trauma cases. Participants identified that medical cases were too limited, with the caseload being mainly traumatic injuries:

“I didn’t do a single medical job while I was there ... and keeping my knowledge up for when you’re applying for jobs and clinical exams and stuff is important. But I definitely think that overall it was a useful placement. We don’t always get lots of trauma, so it’s good to be able to see that.”

This is possibly the reverse of what students experience on a traditional ambulance clinical placement, where the majority of jobs are medical cases.(20)

Despite paramedics working in interprofessional teams in the UK and Canada, and because Australian paramedics mainly work for state-based ambulance services, the following participant could not see benefits of a placement in an interprofessional clinic:

“I think the placement was good ... but maybe not directly related paramedic practice because it was very clinic based. I don’t think it necessarily resembled paramedic work unless you did more with ski patrol, and even then I suppose it’s a different job ... because I found they gave more sit reps over the radio than we do on ambulance placements. ”

In relation to the increased level of situation reports (sit reps) passed by ski patrol, the participant above may not have understood ski patrollers possibly have a limited scope of practice compared to paramedics. Ski patrollers currently complete certificate level courses, and not university degrees. Thus the comparison is not entirely justified. This

finding above also appeared to be the exception and not the rule, and participants highly recommended the placement to further student cohorts:

“I think it’s a good opportunity ... it exposed you to how doctors work, because on ambulance placements you transport the patient and handover at hospital, and then see you later kind of thing. I would recommend to future students to do the placement. It helps if they’re a good skier, I think there’s a lot of scope for them to get out there and do that point of injury stuff, but I think it was a huge benefit to go because I did learn lots more about musculoskeletal injuries. I actually got to reduce dislocations which we talk about in class but we don’t actually do on-road.”

Discussion

An evaluation of the paramedic student clinical placement experience is important from the perspective of key stakeholders, and may have positive implications and applicability for other Australasian university paramedic programs. Furthermore, the interprofessional placements with Medical Rescue snow resort clinics identify the extent to which non-traditional clinical environments can help develop trauma management skills, inter-professional communication and improve confidence levels for undergraduate paramedic students.

While the literature identifies the benefits of interprofessional placements, most of these placement locations were in community settings, aged care facilities and dementia clinics.(6-9) Working in a snow resort medical clinic in New Zealand was a drawcard for engagement in this interprofessional placement. A unique finding was that working with ski patrol, or wanting to pursue a career in medicine were reasons why students volunteered for this opportunity. The high caseload of trauma may have appealed to student anticipatory professional socialisation views or preconceptions about the role of a paramedic being lifesaving, lights and sirens work.(17, 21) However, of particular note was the reported dichotomy between trauma and medical cases, where students voiced concerns about the lack of complex medical cases encountered. Furthermore, the perceived supply demand mismatch between available paramedic jobs and student numbers (1) was a motivator to pursue alternative placements to explore other possibilities in the paramedic job market.

During the Intra-Placement phase, initial frustrations were evident due to the seasonal nature of ski clinic work, as well as no precedence being set for paramedic student involvement in the alpine resort medical clinics. Thus an expectation and reality mismatch may have initially occurred.(22) Another dichotomy was evident as students were trying to learn their place in the clinic environment while simultaneously undergoing a honeymoon phase working at a ski resort, confirming similar findings from the paramedic professional socialisation literature.(17, 21) Gaining workplace acceptance appeared to be linked to clinical performance especially when managing critical patients, further confirming the Skills and Routine Mastery phase in the paramedic literature.(17, 21)

Assimilating into the clinic environment was assisted by the inclusive workplace culture. Research indicates that paramedic students can encounter stigmatisation and marginalisation on ambulance placements due to the paramilitary command and control culture.(17, 18, 21, 23-25) The clinical hierarchy present where the emergency doctor also supervised clinic staff confirms similar findings in the literature.(9) However doctors were readily seen to defer to physiotherapists and other health professional staff for their opinions, and unlike research findings about interprofessional learning, (9) they did not appear to act superior to other health professional groups. Furthermore, observing critical decision making about severe trauma cases was important for students to see that emergency doctors, who are possibly placed on a pedestal, do not have all the answers when working in a challenging alpine environment.

The mutual respect between students and ski patrol, and the ability to perform paramedic skills in a parallel environment possibly improved the clinical skills and confidence levels of students. Of particular note, learning in the clinical environment was multidirectional. Unlike traditional paramedic placements, where learning is more unidirectional, that is to say experienced staff teach students, clinic and ski patrol staff

were able to learn from paramedic students about techniques and equipment which are not commonly used in the hospital or the ski patrol environment. Thus the placement involved interprofessional learning between university students and qualified health professionals.

The restricted view of paramedicine by students was apparent in the analysed results. Professional registration has led to the diversification of the paramedic role in the UK, where paramedics practice in other areas of the health system such as emergency departments and medical clinics, and not solely in a traditional ambulance role. Beliefs associated through anticipatory professional socialisation, (17, 21) and the lack of a clear definition for the term 'paramedicine' (26) may also create misunderstandings for beginner practitioners about future roles for paramedics in Australasia.

While all participants found the placement to be valuable, and would highly recommend it to future students, there were challenging aspects experienced by students. These included a lack of awareness by clinic staff of student capabilities, and students having to seek learning experiences. This finding confirmed similar results in the literature about interprofessional clinical supervision in an allied health context.(3) As it was an inaugural placement, these challenges may not be as significant in subsequent placements, as clinical staff now have an understanding about how to best use paramedic students in an interprofessional team. The initial findings in the current study suggest non-traditional clinical placements as part of an interprofessional team in a snow resort medical clinic appear to be a valid alternative to traditional ambulance placements. However issues around placements costs, accommodation and skiing/snowboarding ability, as well as the seasonal nature of snow sports impact on how often these placements can occur, as well as the suitability of students to engage in this opportunity.

Limitations and Significance

The small number of participants may be seen as a limitation to the study. The findings of this study reflect the experiences of the participants (n=6), and not the placement cohort as a whole. A possible limitation was that the researchers' reflexivity was not addressed. To limit bias, well known coding techniques were used and 'intercoder reliability' (27) was undertaken to address the possibility of bias. The study only investigated the experiences of paramedic students taking part in the placement, and not the views of clinic or ski patrol staff. While this was outside of the scope of this study, it is intended that further research may include the view of student paramedic capabilities as seen by clinic staff in future placements. Despite these possible limitations, the study makes a unique contribution to the paramedic discipline, as to date there are few Australian or international peer-reviewed studies which examine non-traditional placement opportunities for paramedic students in an interprofessional snow sport injury clinical setting.

Conclusion

Undergraduate paramedic student clinical placements in interprofessional snow resort medical clinics are possibly a valid alternative to the traditional ambulance placement model which is reaching capacity in many state-based jurisdictions. Three phases were identified which help to examine the experiences of undergraduate paramedic students' experiences when engaging in non-traditional interprofessional placements, namely the Pre-Placement, Intra-Placement and Post-Placement phases. Benefits associated with the placement included working overseas, improving maturity levels, developing an understanding of interprofessional practice and interprofessional communication. Challenges associated with the placement related to clinic staff initially being unaware of student capabilities. While the cost could be seen to be prohibitive, participants chose to view it as an investment in their future. The limited number of sports available and the seasonal nature of snow sports are a disadvantage to this model being used as a mainstream placement in the paramedic program at QUT.

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LITERATURE REVIEW

**DROWSY AND DANGEROUS? FATIGUE IN PARAMEDICS:
AN OVERVIEW**

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Abstract**Background**

Fatigue is a complex phenomenon that has effects on physical characteristics, cognition, behaviours, and physical and mental health. Paramedicine crosses the boundaries of many high-risk industries, namely medicine, transport and aviation. The effects of fatigue on paramedics thus need to be explored and considered in order to begin to identify appropriate interventions and management strategies.

Aim

The aim of this article was to provide an overview of fatigue in paramedics and its potential effects on various areas of practice and provider health, and to outline potential solutions to assess and manage the risk of fatigue in paramedics as suggested by the literature.

Methods

We conducted unstructured, non-systematic searches of the literature in order to inform an overview of the literature. An overview is a summary of the literature that attempts to survey the literature and describe its characteristics. We thematically structured the review under the following headings: defining occupational activity and health status; clinical performance and patient safety; shift length and time at work; effects on paramedic health; effects on driving abilities; fatigue risk management; and, fatigue proofing.

Discussion

Fatigue should be considered in the context of overall paramedic health status and paramedic occupational activity. The nature of paramedic shift work, and the associated occupational activity place paramedics at increased risk from fatigue. Shift work may also contribute to sleep disorders among paramedics. Fatigue is associated with increased errors and adverse events, increased chronic disease and injury rates, depression and anxiety, and impaired driving ability.

Conclusion

The issue of fatigue in paramedicine is complex and has serious consequences for patients and paramedics. Paramedic services and paramedics need to work collaboratively to identify and action appropriate measures to reduce the effects of fatigue on the wellbeing of the workforce and mitigate its effects on clinical performance and safety.

Keywords: fatigue; paramedic; EMS; mental health; physical health; sleep

Introduction

Fatigue is a complex phenomenon that is not particularly well defined in the literature. Often simplified to sleepiness, or tiredness, it is a complex interplay of physical, psychological, socioeconomic, and environmental factors that affect both mind and body. (1) Some argue that fatigue, and the physiological impairment that can result, are separate, distinct and need to be clearly distinguished from one another. Causative factors in fatigue are the length of continuous work spells and daily duty periods, time available for rest and continuous sleep, and the arrangement of duty, rest, and sleep periods within each 24-h cycle.(1) In addition, the underlying health status of the paramedic is an important factor in the development of fatigue including sleep quality, diet, stress levels, and mental health.

Fatigue is an entirely subjective, personal experience (2), and can manifest itself differently from one person to another. One individual may not feel fatigued but may demonstrate impaired functioning. Alternatively, another individual may demonstrate adequate performance, but may experience extreme tiredness or discomfort.(1) Paramedicine is a high risk, high reliability work environment that places significant demands on the paramedic with potential for harm to patients and the workers. Paramedic practice also crosses the boundaries of several high risk industries including medicine, and transport. As such the effects of fatigue on paramedics need to be explored in order to begin to identify appropriate interventions and management strategies.

Aim

The aim of this article was to provide an overview of fatigue in paramedics and its potential effects on several identified areas of practice and provider health, and to outline potential solutions to assess and manage the risk of fatigue in paramedics as suggested in the literature.

Methods

We conducted unstructured, non-systematic searches various electronic databases (MEDLINE, CINAHL, EMBASE, Google Scholar) using combinations of keywords and subject headings where appropriate including paramedic, Emergency Medical Services (EMS), fatigue, driving, 'mental health', obesity, 'patient safety'. An overview is a summary of the literature that attempts to survey the literature and describe its characteristics, and aim to "provide a broad and often comprehensive summation of a topic area and, as such, have value for those coming to a subject for the first time" (3). It is not intended to be exhaustive in its identification of the literature. We structured the overview thematically under the following headings: defining occupational activity and health status; clinical performance and patient safety; shift length and time at work; effects on paramedic health; effects on driving abilities; fatigue risk management; and, finally fatigue proofing.

Defining paramedic occupational activity & health status

When considering fatigue in paramedics, it is first important to define paramedic occupational activity, and the health status of paramedics. Paramedics are noted to adapt or fit the delivery of care into their work context: the unpredictable out-of-hospital environment, which makes them relatively unique in the world of healthcare.(4) While paramedic work can be very unpredictable, the following demands could be expected in carrying out the occupational tasks: standing/walking, sitting, lifting and carrying, bending, crouching/kneeling, climbing, reaching, pushing/pulling and handling/grasping (5), in a work environment that can follow a rotating schedule. These demands and their effect on the development of fatigue have not been well quantified in the literature. What has been well reported is that paramedics have high injury rates compared to other occupations (6,7), with resultant rates of sick time and worker's compensation claims that are significant.(8,9) Additionally, paramedics have markers of poor health status such as elevated Body Mass Index (BMI) (10–13), cardiovascular disease with a high prevalence of hypertension (14–16), and low rates of exercise.(11)

Physiological response to paramedic occupational tasks has also not been well studied. In one of the first studies of the cardiorespiratory physiological demands of

paramedics Gamble et al. (1991) monitored heart rate in 8 paramedics in Northern Ireland over a total of 21 shifts. The data showed periods of high activity that included CPR and carrying patients that resulted in heart rates above anaerobic threshold for periods of up to 11 minutes.(17) As well as the physical demands, other occupational stressors can elicit heart rate responses. Karlsson et al. (2009) noted that paramedics exhibited significant increases in heart rate not related to physical exertion of an emergency call and postulated that this was due to other occupational stressors (for instance responding to a report of an ill child).(18) Similarly, level of care influenced heart rate response. Paramedics were observed to have significantly higher heart rate changes (in beats per minute) on the intensive care unit as opposed to the patient transport unit (30 ± 17 bpm versus 7 ± 8 bpm respectively, $p < 0.001$).(19) The implication for paramedics, especially those whose health status is low, is that they may be more prone to fatigue with increased heart rate response due to physical or occupational stressors.

Clinical performance and patient safety

By taking cues from other industries, it is demonstrable how fatigue is directly related to performance in shift work.(20–23) A growing body of evidence suggests that fatigue in paramedics can potentially have an inverse relationship with performance. It is estimated that between 10% and 55% of EMS clinicians suffer from severe mental and/or physical fatigue.(24–27) Increased levels of fatigue are associated with compromise in cognitive function (28,29), impaired task performance (30); increased error and accident rates, and ultimately reduced safety.(31) Patterson et al. demonstrated that paramedics who were fatigued (OR 2.3, 95% CI 1.5, 3.3) or reported poor sleep quality (OR 1.5, 95%CI 1.0, 2.1) were more likely to report an error or adverse event in practice.(25) In addition, they demonstrated that the odds of committing an error or adverse event, or of engaging in safety-compromising behaviours were 2.2 (95% CI 1.4, 3.3) times greater and 3.6 (95% CI 1.5, 8.3) times greater, respectively, among the fatigued EMS clinicians than the non-fatigued.(32) Donnelly et al. concluded that injury or exposure ($p < 0.02$), safety compromising behaviours ($p < 0.01$) and medication errors ($p = 0.01$) are all significantly related to fatigue.(33)

Nurses also suffer from the effects of fatigue. Those who reported an error or near miss obtained significantly less sleep than nurses who did not report an error or near miss.(34) Compared with day shifts, risks of injury or error are 28% higher for night shifts. When compared with 8-hour shifts, 12-hour shifts increased risk of injury or error by 28%.(35) Working overtime, whether at the end of a regularly scheduled shift (even an 8-hour shift) or working more than 40 hours in a week, is associated with an increase in the risk of an error.(36,37) Accident rates increased during extended periods of work: they rose after 9 hours, doubled after 12 consecutive hours, and tripled by 16 consecutive hours of work.(38,39)

Effects on paramedic health

Fatigue experienced by paramedics and other healthcare professionals is associated with an increased risk of depression and anxiety.(40) Paramedics have previously scored in the above normal ranges for depression (36.1%), anxiety (24.6%), and stress (39.3%).(41) The risk appeared similar among shift working paramedics in both rural and metropolitan areas.(41) Sofianopoulos et al. (2011) concluded that 26.7% of paramedics studied in relation to fatigue had a mild likelihood of depression, 10% had a moderate likelihood, and 1.7% had a severe likelihood.(42) Fatigue is also associated with burnout and lack of support from management.(32) Given recent evidence suggesting that paramedics and EMS personnel are more susceptible to suicidal ideation than other first responders (43,44), this potential link between fatigue and paramedic mental health is concerning.

Shift work, and working extended shifts (> 8 hours) have adverse effects on worker health, including increased risk of chronic disease, obesity, and risk of injury or accident.(45) Paramedics may have a higher prevalence of sleep disorders than other healthcare professionals (46), and left untreated, those problems could increase morbidity and mortality and potentially impair professional performance. An often overlooked area is the difference between sleep opportunity and actual sleep or rest. Shift workers suffer

from many different sleep pathologies, and aspects of their job lead to sleep periods that are not restful or restorative. A majority (68%) of Australian paramedics studied reported poor sleep quality.(42) Paramedics may identify as being fatigued even when the period of “rest time” between shifts is considered adequate. There is convincing evidence that sleep duration is linked to metabolism and the regulation of appetite, and decreased sleep times may contribute to increased obesity rates. The link between sleep and maintenance of a healthy weight is well documented and there is a demonstrated association between sleep loss and an increased risk of obesity and type 2 diabetes.(47,48)

Effects on driving abilities

Fatigue is considered to be the largest identifiable and preventable cause of accidents in transport operations (between 15 to 20% of all accidents), surpassing that of alcohol or drug related incidents in all modes of transportation.(49) Official statistics often underestimate this contribution, and as such, fatigue is insufficiently recognized and reported as a cause of road accidents.(1) Fatigue, and sleep deprivation can cause impairment similar to that caused by alcohol intake.(50,51) The effects of fatigue on driving stem largely from prolonged and irregular working hours, such as alternating day and night shift patterns familiar to many paramedics, rather than simply from time spent at the wheel. Alertness, vigilance, concentration, judgment, mood and performance are all significantly affected by fatigue (42,52–54), and drivers are encouraged to avoid driving after sleep restriction, even on relatively short trips especially if they feel sleepy. (55) A 2009 study in Japan suggested that a modified night shift (which ensured time for paramedics to take long, restful power naps) alleviated subjective fatigue, and improved physiological function which are often adversely affected by night workload.(56)

Fatigue risk management in paramedic services

High risk professions that require high reliability in decision making and performance are therefore subject to risk as a result of physical and cognitive fatigue. Traditional approaches to fatigue management have mainly attempted to limit shift length and promote adequate rest between shifts. This approach may have inadequate impact, especially for workers on night shift and in professions such as emergency services where periods of effort and cognitive load are often unpredictable and have a high potential for sustained periods. Many high risk, high reliability professions have adopted Safety Management Systems (SMS).(57) Paramedicine crosses the boundaries of many of these industries: medicine, transport and aviation. It therefore stands to reason that a paramedic service should have a robust SMS that incorporates fatigue management as a key principle in the reduction of risk, prevention of errors, and enhancement of patient and paramedic safety. Paramedicine faces some unique challenges in this regard in that paramedic services are often designed to respond to emergencies, and perform interfacility transfers. This crossing of boundaries may present challenges when looking to the evidence in other sectors.

The Threat Error Management (TEM) model developed for aviation Crew Resource Management (CRM) provides a model that focuses on individual, team and organizational interventions to reduce threats and hazards.(58) The TEM model approaches threat and error management as a partnership and joint responsibility between workers and an organization. The mainstay of this approach is the requirement for a just culture and collaborative safety model. Organizations that are able to implement such a model are considered to have mature SMS programs. Based on the work of Dawson and McCulloch (57), a Fatigue Risk Management System (FRMS) applies four defensive layers to an SMS program.

1. Sleep Opportunity, shift work patterns, strategic rostering and fatigue modelling tools;
2. Sleep logging: opportunity and actual;
3. Symptoms checklist, self-report behaviour scales, physiological monitoring;
4. Fatigue proofing strategies, SMS error and near miss reporting.

Despite all of these layers of defence built into an FRMS there is still high potential of error or accident resulting from fatigue. A collaborative culture of safety, and just

culture, needs to be present to continually improve the mitigation of these risks following an event. Organizations with a reliance on a prescriptive policy and compliance through punitive means may struggle to build an effective SMS approach which depends on a trusting and open reporting culture.(59) Steps in building such a system include revisiting workplace policies and guidelines using a just culture approach. Incorporating human factors and an end-user design process has been shown to build a positive work culture with greater trust when designing for patient and worker safety.

Fatigue Proofing

Even with the implementation of robust FRMS using lessons learned from other industries, overall fatigue risk management still requires individual action and cultural buy in. The effects of fatigue on performance may be downplayed or individuals may consider that fatigue does not impact them.(60) This culture likely exists within paramedic services. Even with FRMS designed to reduce the risk of fatigued individuals in the workplace, it is very likely that this will still occur. Organizations therefore also need to build in fatigue-proofing systems, which act as risk-reduction behaviours when fatigued individuals are still in the workplace.(61,62) Often fatigue-proofing happens informally and naturally.(61,63) There are a number of common fatigue proofing strategies previously discussed in this article including: caffeine, napping, and exercise.

These strategies are also outlined in national fatigue guidelines developed in the US (62), along with their associated outcome measures.(64) Less commonly discussed fatigue proofing strategies can be divided into task related and behaviour related adaptations.(65) Task related adaptations include task slowing, delegation, cross-checking, and task rotation between individuals. The primary behavioural adaptation involves increasing the amount of verbalisation of steps during the performance of complex tasks. Fatigue proofing tends to develop organically within organizations, but can have significant impacts on avoidance of fatigue related errors.(65) Logging of opportunity versus actual sleep can yield valuable data. Paramedic services can also identify high risk areas for fatigue related errors through incident review and staff focus groups. These can then be used as targets for fatigue proofing strategies, and services can work with staff to improve and enhance the informally developed fatigue proofing strategies as a component of the FRMS.

Recommendations

Further research is urgently required in relation to fatigue in paramedics. In particular, this review has highlighted the need for research on paramedic health status as the foundation for future research into fatigue and its impact on paramedics. The safety impact of shift length and pattern raises questions – if medication errors occur, when do they happen? Are they related to extended shift patterns, time of day/night? Are there other factors to consider such as paramedics activities on rest days, or working multiple jobs? Does the reliance on “on-call” staff in rural and remote areas contribute to fatigue in these workers?

Fatigue management should be incorporated into paramedic education in order to prepare new entrants for entry to practice, and practicing paramedics should also be offered education and resources. The best method to achieve this requires further investigation. Further, the implementation of robust SMS and FRMS approaches within paramedic services warrants research and dissemination.

Limitations

This overview is subject to a number of limitations. We did not conduct reproducible, structured searches in our search for literature. As this was an overview designed to provide a broad and comprehensive summation, we agreed that structured searches limited to fatigue in paramedicine would not have enabled us to explore related issues that were relevant from other industries. As such, we may not have identified all relevant literature. We did not conduct a quality assessment on any of the identified literature.

Conclusion

Fatigue is a complex, multi-faceted issue within paramedic practice, and paramedic services. It is both caused by, and a symptom of other system issues such as shift length,

case complexity, and workload, in combination with individual health status, stress levels, lifestyle, and mental health. Fatigue risk management is a shared responsibility of both the paramedics and the organisation and it needs to be considered an integral part of the organisational culture. Without the support of management, paramedics may feel disenfranchised and undervalued. This support should focus on strategies to mitigate the increased risk of burnout, job dissatisfaction, and absences that are associated with fatigue in healthcare providers.⁽⁶⁶⁾ Building positive work cultures leads to an environment that can mitigate fatigue risk in the paramedic work environment. As this trust is built and matured; the system can engage staff in discussion that identifies cultural safety nets that can be formalized and areas identified for improvement, further building towards an environment of self-reporting and self-identification of hazards, risks and proactive prevention through cooperation. Paramedics need to be supported when they make risk assessments regarding their fatigue levels. Fatigue management can include changes to shift patterns, restriction of overtime after night shifts including shorter duration of shifts, scheduled breaks, education and resources on fatigue management, and monitoring of fatigue levels. In addition, it can incorporate lifestyle changes, access to occupational health services, input from sleep specialists, and a myriad of other strategies that can be considered by services willing to invest in the wellbeing of paramedics and patients.

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