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SHORT REPORT

The neuron model: An educational tool for evidence-based practice and interprofessional care

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Abstract

Objective: The objective of the study was to assess the usefulness of the neuron model in educating how evidence-based drug information and interprofessional care interface. **Methods**: The Neuron model of evidence-based practice and interprofessional care was introduced in an online session to a group of healthcare professionals at a United Arab Emirates (UAE) tertiary-level care hospital in March 2021. A Google Form survey was used to assess the usefulness of the neuron model. **Results**: Among those who responded to the form, 90% of healthcare professionals said that the neuron model was useful. This agreement improved significantly (Wilcoxon Signed-Rank test *p*-value > 0.05), and persisted even after six months. **Conclusion**: The healthcare professionals agreed that the neuron model was beneficial in visualising how evidence-based practice and interprofessional care interface with each other, integrate into the academic health system, and help identify areas of improvement for healthcare professionals.

Introduction

It is natural for healthcare professionals and students in academic health systems to be involved in evidence-based practice (EBP) and interprofessional care (IPC). However, some learners may struggle with integrating into interprofessional teams (Nyoni *et al.,* 2021). They may be unable to recognise that they are part of the EBP and IPC framework. There must be collaborative efforts to move from silos to collaborative practice. A framework that allows all stakeholders to communicate could be useful in reducing barriers to IPC (Newhouse *et al.,* 2010; Stokke *et al.,* 2014; Olswang *et al.,* 2017). The neuron model is an educational tool to popularise how EBP and IPC interface. The provision of drug information services by pharmacists is founded on EBP and IPC concepts; this skill develops with proper training (Nandiwada *et al.,* 2018; Thomas *et al.,* 2019).

The neuron in the human body is utilised as an analogy to help explain these concepts. Interprofessional care is like an axon that delivers patient care all at once. Different professionals and their sciences are like the axon terminals, which travel out from the axon on different routes for specialisation. Each patient encounter contributes to learning, and with more extensive studies, higher-quality evidence is generated. Crossing synapses requires screening using evidence of best quality with critical appraisal. Dendrites facilitate the pooling of evidence to a common body of knowledge in the neuron cell body. Integration of evidence, the expertise of different professionals, and consideration of patient values happen collaboratively in the neuron cell body. The nucleus is the educational and practice leadership that guides the whole process. With these coordinated efforts, evidence-based interprofessional care can proceed successfully in an academic health system (Thomas *et al.,* 2020).

The objective of this study was to assess the usefulness of the neuron model in educating how evidence-based drug information and interprofessional care interface.

Methods

A content-validated Google Form survey was used for data collection before and after introducing the neuron model through an online educational session. The

session was part of a course for healthcare professionals on drug information management in IPC in March 2021. The same Google Form survey was repeated six months after the educational intervention to observe if the usefulness of the model persisted. The study population included doctors, nurses, and pharmacists at a tertiary-level care hospital in the United Arab Emirates. Informed consent was taken from participants and data collection started after approval from the institutional review board.

The hospital is an integral part of a University academic health system. The hospital is on the same campus as the University. In an academic hospital, healthcare professionals are heavily involved in education and research. Strongly Agree and Agree were responses considered as being in agreement, and were calculated as a percentage. Any statistically significant difference between responses before the educational event, after the educational event, and six months later was calculated using the Wilcoxon Signed-Rank test. SPSS version 26 was used for all calculations and analyses.

Results

The neuron model was described to a total of 37 healthcare professionals, including doctors, nurses, and pharmacists (approximately equal numbers). Among them, 30 healthcare professionals filled the survey immediately after the educational session, and 25 of them repeated the survey after six months.

The number of respondents who responded with Agree or Strongly Agree, in regards to their understanding of how EBP and IPC interface, increased from 33% before the neuron model was introduced to 67% after it was introduced. Similarly, the neuron model helped practitioners realise how EBP and interprofessional education and care are integrated into the academic health system: 63% of respondents strongly agreed after the course compared with 30% before the course. Consistent with the previous strong agreements, 67% reported that the neuron model helped them identify areas of improvement after the course compared with 30% before the course.

Tables I and II describe the difference in levels of agreement between the surveys during the course and the surveys six months later. The same online survey was used six months after the educational intervention session was held, and the agreement of the study participants did not differ significantly. P-values from the Wilcoxon Signed Rank test for study participants' agreements after six months compared to right after the intervention were more than 0.05. However, the level of agreement consistently remained elevated compared with the pre-intervention agreement rates.

Table I: Rates of agreement with survey items before, immediately after, and six months after the intervention

Survey item	Agreement pre-intervention	Agreement post-intervention	*p*-value
The neuron model of evidence-based practice (EBP) and interprofessional care (IPC) will help me to visualise and understand how EBP and IPC interface	76	94	< 0.01
The neuron model will help me to realise how evidence-based practice and interprofessional education and care is integrated into the academic health system	70	96	< 0.01
The neuron model will help me to identify areas of improvement in my evidence-based practice and interprofessional care	67	94	< 0.01

Table II: Statistical significance of the difference between the post-course survey and the survey after six months

Survey item	Agreement post-intervention	Agreement six months later	*p*-value
The neuron model of evidence-based practice (EBP) and Interprofessional Care (IPC) will help me visualise and understand how EBP and IPC interface	94	92	0.813
The neuron model will help me realise how Evidence-Based Practice and Interprofessional Education and Care is integrated into the Academic Health System	96	92	0.593
The neuron model will help me identify areas of improvement in my Evidence-Based Practice and Interprofessional Care	94	96	0.527

None of the study participants was aware of the neuron model before the survey and educational session in March 2021. Just by reading the survey, which included a picture (Figure 1), and a small description of the neuron model, agreements reached 76, 70, and 67% for the survey items. A significantly higher agreement was achieved after the educational session.

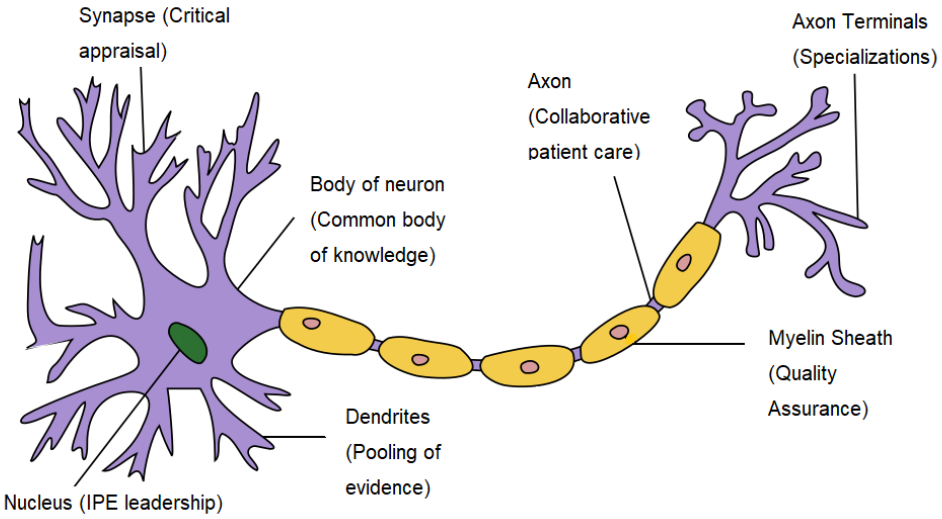

Figure 1: The neuron model of interprofessional education and evidence-based practice (Adapted from Jarosz Q. Wikipedia) (Thomas *et al.,* 2020)

Discussion

The neuron model of evidence-based practice and interprofessional care helped the course participants visualise how EBP and IPC should integrate into the academic health system, and it helped them identify areas of improvement in this regard. Well-planned training was found to improve the EBP of healthcare professionals in previous studies (Black *et al.,* 2015). Such training should be based on well-mapped competency frameworks that are intended to improve educational outcomes (Lehane *et al.,* 2021). Training for IPC was also found to be effective, as interprofessional team training has successfully improved clinical practice outcomes of healthcare professionals and patients (Schmidt *et al.,* 2021).

Didactic, simulation and experiential teaching techniques are also useful for teaching interprofessional care (Bridges *et al.,* 2011). Online education tools to develop evidence-based practice in an interprofessional context were found to be effective in imparting the required knowledge and skills. Participants stated in their feedback survey that they found online education beneficial (Aronoff *et al.,* 2017). Evidence-based practice competencies can be achieved through the interprofessional approach of an online course (Gresham-Anderson *et al.,* 2020).

No perfect methods have been described for the education of evidence-based practices to a team of interprofessional participants. However, several other methods have been found to be beneficial (Ritchison *et al.,* 2021). Multimodal and pragmatic approaches can integrate EBP and IPC to improve the quality of care (Lehane *et al.,* 2019). A well-designed and simple framework facilitates the replication of sustainable educational outcomes and promotes further research (Christopherson *et al.,* 2015). This study suggests that the use of a visual scientific analogy may be useful for educating providers on these topics.

The limitations of the study are that the Neuron model was perceived to be useful to healthcare professionals as part of their continuing education, and the survey was performed among healthcare professionals at one large academic health system in the UAE.

Conclusions

The neuron model was perceived to be useful in helping participants visualise how evidence-based practice and interprofessional care interface with each other in the academic health system, and healthcare professionals found it useful to identify areas of improvement in interprofessional collaboration. Future research is required to determine the utility of the neuron model

as an educational tool and develop related assessment elements in evidence-based practice and interprofessional care.

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