

Theoretical Framework to Assess Peripheral Intravenous Catheter Insertion and Care Practices in Paediatric Patients: A Literature Review

*1st Ferika Indarwati

*School of Nursing, Faculty of Medicine
and Health Science
Universitas Muhammadiyah
Yogyakarta
Yogyakarta, Indonesia
School of Nursing, Institute of Health
and Biomedical Innovation
Queensland University of Technology
Queensland, Australia
ferika.indarwati@umy.ac.id*

2nd Judy Munday

*School of Nursing, Centre of
Healthcare Transformation
Queensland University of Technology
Queensland, Australia
Faculty of Health and Sports Sciences
University of Agder
Grimstad, Norway
judy.munday@qut.edu.au*

3rd Samantha Keogh

*Centre of Healthcare Transformation
Queensland University of Technology
Queensland, Australia
s2.keogh@qut.edu.au*

Abstract— Theoretical frameworks are used to guide research processes as well as to accommodate the multiple constructs of the phenomena being evaluated. A literature review was undertaken to identify a theoretical framework to inform a study of paediatric peripheral intravenous catheter (PIVC) utilization in hospitals in Indonesia. The literature search was undertaken in four databases: US National Library of Medicine National Institutes of Health, Cumulative Index of Nursing and Allied Health (CINAHL), Embase, and Google Scholar using the predefined keywords. Further searches across reference lists were also conducted. All relevant articles were screened and analyzed for inclusion and exclusion criteria based on the research questions, aim and objectives. Among the theoretical frameworks identified in the literature the Donabedian theoretical framework offered the most comprehensive model to assess the current state of paediatric peripheral intravenous catheter insertion and care practices in hospitals. The Donabedian framework provided a construct to investigate the interdependent components of structure, process, and outcomes (S-P-O) of PIVC insertion and management service in paediatric population. This framework also supported the use of multiple data collection methods to study the PIVC service. The Donabedian S-P-O model provides a useful framework to assess healthcare service in general and in paediatric PIVC in particular. The use of this framework enables the researcher to identify relevant indicators as well as to understand the strengths and weaknesses of each dimension of the healthcare services.

Keywords— *healthcare service evaluation, theoretical framework, the Donabedian model, paediatric, peripheral intravenous catheter, nursing care*

I. INTRODUCTION

The majority of paediatric patients in hospitals have at least one peripheral intravenous catheter (PIVC) inserted during their hospital stay making PIVC insertion and care the most frequent invasive procedure undertaken by healthcare staff (1). It is primarily used for drug and fluids administration, and only a small percentage are inserted for

other purposes such as blood transfusion and nutrition deliveries(2). PIVC characteristics, patient characteristics, documentation, failure and complications, and risk factors for failure are among variables mostly reported in these studies(3, 4). Despite the vast amount of literature regarding PIVC use and practice published worldwide, studies investigating PIVC use and practices including patients' experience, in the paediatric population in Indonesia remain scarce.

The assessment of PIVC insertion and management practices in paediatric patients is crucial to ensure patient safety, to reduce costs and to improve patient satisfaction [5]. Assessment and evaluation of the healthcare service performance are integral and fundamental parts of planning, organisation and administration [5-7]. Evaluation of PIVC insertion and care practices, including utilisation, staff capacity, and outcomes as well as patient experience provides a mechanism to assess the quality of the service, identify what works and what does not work, guide future improvement projects, guide health policy and planning of the management and provision of services[8]. Furthermore, assessing PIVC insertion and management practices ensures transparency, accountability and adequacy of the service for patients.

Nevertheless, assessing healthcare practices such as PIVC insertion and management practice is a complex and challenging process. Assessment of the healthcare performance is viewed as an abstract and nebulous concept to be precisely defined or objectively measured [9]. The measurement has to actually measure what it is supposed to measure, needs to be used and interpreted correctly, and should be repeatable after implementation of practice change to determine effects [5]. Therefore, a guiding framework reflective of the key variables are important. A theoretical framework is a set of abstract concepts that provide a coherent explanation of certain phenomena that help the researcher to plan their study [10]. The theoretical framework connects the researcher to existing knowledge,

gives a basis for the study hypothesis, and guides the selection of methodology and methods in the research. Therefore, in this report, the process used to identify an appropriate theoretical framework to assess PIVC use and practice in paediatric patients in Indonesia is discussed.

II. RESULT

The initial literature search yielded 4493 articles. After removing duplicates and screening the title, abstract and full text against the study’s assertion criteria, five prominent theoretical frameworks for assessing the current state of PIVC insertion and care in paediatric patients were identified. Potential frameworks are described in Table 1.

TABLE I. LIST OF THE POTENTIAL FRAMEWORKS

Author, Year	Health assessment main concepts
Ovretveit, 1992	Professional, client and management
Deming, 1986	Economic indicators
Larrabee, 1996	Value, beneficence, prudence and justice
Pasuraman, Zeithaml & Berry, 1985	Service quality (SERVQUAL)
Donabedian, 1988	Structure-process-outcome

Ovretveit’s framework (1992) proposed that the performance of healthcare services can be measured from three dimensions: namely professional, client, and management. The professional dimension focuses on meeting patients’ needs using correct techniques and procedures. The client dimension refers to direct benefits from service to patients. The management dimension refers to efficiency in delivering the service[11]. This model is developed based on Deming’s (1986) total quality management model that is mostly criticised for its lack of consistency of the concept and limited prescriptive example for each dimension, particularly if implemented in healthcare services [12, 13].

Larrabee (1996) developed the healthcare assessment model and conceptualised four dimensions (value, beneficence, prudence, justice) as components of healthcare service/practice quality. This model provides insights both from ethical and economic perspectives of healthcare performance[14]. Nevertheless, the four dimensions of this framework could not provide comprehensive understanding of the current studygoals, which is to gain high level understanding of PIVC use, outcomes, and process of delivery.

Parasuraman and colleagues’ quality model (1985), which perceived service quality from ten dimensions namely performance consistency, communication, competence, courtesy, credibility, security, understanding, and tangibles [15]. This framework is rooted in marketing discipline and more focus on consumer satisfaction rather than other dimensions such as quality of care structures or resources, which may influence outcomes [16].

Donabedian (1966) proposed the triad structures (S), processes (P), and outcomes (O), known as the S-P-O, as a framework for assessing the quality of care (Figure 1).

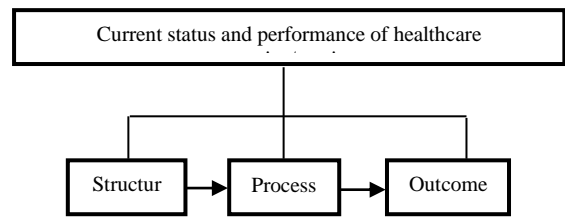


Fig. 1. The Donabedian SPO Framework (Donabedian, 2003)

The structure refers to the material, organisational and human resources characteristics used in the provision of care to clients (e.g., number and qualification or quality of staff and equipment). The process covers all activities related to care delivery including prevention, diagnosis, treatment, and rehabilitation (e.g., health professionals and patient activities related to care). Outcome focuses on the result of the care provided (e.g., disease, disability, recovery), which later also includes the patient’s satisfaction and experience as an integral part of healthcare quality [9]. The three domains of structure, process, and outcome, when integrated and sourced from reliable data allow researchers or stakeholders to obtain a more comprehensive picture of care delivery. These three elements are interdependent, with each directly influenced by the antecedent [17]. The improvements in the structure of care should lead to improvements in clinical processes, which should, in turn, improve patient outcomes [18].

Donabedian's framework offers a comprehensive model to assess healthcare performance, has gained more acceptance than other conceptual models and is mostly used by health professionals [18-20] including those in vascular access research [21-25]. Further assessment of the suitability of the Donabedian theoretical framework to the study of PIVC insertion and management practices in paediatric patients was conducted. The chosen framework should provide a comprehensive insight of PIVC insertion and care in paediatric patients and to guide the study constructs, methodology and methods to achieve the overarching study goals. Among the five frameworks discussed above, the Donabedian framework is considered as the most potential framework to be used in the study to assess paediatric peripheral intravenous catheter insertion and care service from the point of views of healthcare providers, healthcare staff and also patients and families.

III. DISCUSSION

The three domains of structure, process and outcome in the Donabedian framework allows researchers or stakeholders to obtain more comprehensive picture of care delivery. These three elements are interdependent with each directly influenced by the antecedent [17]. By stressing the linkage between the three parts, the Donabedian model emphasizes that health care outcomes cannot be understood in isolation, but only by first examining the effectiveness of the structure and the processes of care that produce those outcomes [26]. The improvements in the structure of care should lead to improvements in clinical processes, which should in turn improve patient outcome [18].

In summary, the Donabedian framework allows stakeholders particularly the healthcare team and researchers to assess not only the overall picture of care delivered but also to gain specific insights of each individual aspects of

care such as the structures, processes and outcomes of the service [18, 19]. Therefore, the Donabedian framework is considered as the appropriate framework to assess the current overall picture of PIVC service delivery as well as investigates each part of the service from the structure, process and outcomes.

Nevertheless, the Donabedian framework provides only a generic guidance of essential domains of care that need to be assessed to obtain the current status of healthcare service delivered. To understand the prescriptive aspects of the specific care being examined in a study and its interrelationships, examination of research in this specific area should be undertaken [27]. The use of Donabedian framework needs further explanation if implemented in a specific area of care. In the nursing domain, Jones (2016) extrapolated sensitive examples of the Donabedian Structure-Process-Outcome model from several nursing care quality indicators publications [28-31]. The nurse sensitive examples of the structure of care includes nurse characteristics, care model, organisation accreditation and certification. The process of care comprises nurse surveillance, education and counselling, discharge planning, coordination of care, assistance with ambulation, medication administration and monitoring. The nurse sensitive example for outcomes such as patient self-care, health promoting behaviours, functional status, complications and adverse event, symptoms management, knowledge of disease and treatment, satisfaction with care, and health related quality of life [27].

Several published quality improvement studies in vascular access conducted in both the adult [21-24, 32] and paediatric population [25, 33] have utilised the Donabedian framework as an underpinning concept for their study. According to these studies, the structure indicators include amenities of venous access care [21], nurses' education, training and experience [23], hospital attributes (number of beds and annually patients visits, certification) and resources (number of skilled vascular access nurses, vascular access equipment, policy/guideline) [22, 25], patient profiles, and device characteristics [24]. The process indicators such as patient-practitioner interactions [21], vascular access insertion and maintenance care (frequency of dressing, maintenance of catheter patency, and attention to signs of inflammation) [21, 23, 24]. The outcomes include patient satisfaction and experience [21], first-attempt success, equipment used [22], pain [21] and catheter complication rates reduction [21-25].

A further criticism of the Donabedian framework is related to whom the structure-process-outcomes quality should be asked and whether this should be the patients, providers, policy makers, or all of these. [34]. Previous studies suggest that assessment of quality in healthcare relies heavily on the provider's perspective[35]. More recent studies indicate that providers may have different insights from the service users about the quality of the service and factors that important for the improvement of the service outcomes [20, 34-36]. Therefore, inclusion of patients' perspectives is needed to balance opinions [37]. Research recommends that data should be collected from providers as well as patients, and analysed on a comparative basis to ensure that elements of services that patients view as important dimensions of quality are included in an appropriately weighted way [34].

IV. CONCLUSION

Continuous assessment of healthcare service is essential to improve the quality of care provided. In order to assess the current status of healthcare service, health professionals and researchers in particular need to be aware of the structure-process and outcome indicators specific to the service. The Donabedian S-P-O framework allows researchers to comprehensively understand the current status of healthcare services or practices being evaluated, not only from the outcome perspective but also from the antecedent factors (structure and process) and construct the quality improvement project based on the evaluation of the structure, process and outcomes of the current service [28]. The structure gives the quality perspective from the providers, the process provides insights from both provider and patients activities in the care, and the outcome provides the objectives as well as subjective measures of the care results [25]. Therefore, the Donabedian framework can be used as a potential model to guide the assessment of healthcare service in general and current paediatric peripheral intravenous catheter insertion and care in particular, providing a structure of data collection and analysis.

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