Evaluating the efficiency of one stop crisis centres in managing domestic violence cases

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ABSTRACT

Introduction: As domestic violence (DV) poses a critical threat to public health worldwide, this prompts the need for efficient and effective intervention. In Malaysia, although One Stop Crisis Centres (OSCCs) have been offering multisectoral services to DV victims for many decades, an evaluation of the efficiency of these centres has yet to be conducted. This study aimed to assess the efficiency and effectiveness of three Malaysian OSCCs using a two-stage Data Envelopment Analysis (DEA) approach.

Materials and Methods: A total of 153 adult DV victims were recruited from OSCCs in Sarawak General Hospital, Universiti Malaya Medical Centre, and Hospital Universiti Sains Malaysia. The inputs included the number of doctors, nurses, and other personnel whereas the outputs were total response time and service quality, measured via a validated 35-item OSCC-Qual instrument. Stage 1 employed an input-oriented Banker, Charnes, and Cooper (BCC) DEA model to determine how efficiently OSCCs managed resources to minimize response times. Stage 2 used an output-oriented BCC model to evaluate the centre's ability to maximize service quality.

Results: The social workers unit recorded notably long mean response times across three centres. Correlation analysis revealed a strong negative association between the number of personnel and the multisectoral coordination dimension of service quality. While most units showed high pure technical efficiency in the input-oriented DEA, scale inefficiencies were shown to be common in all centres. Pure technical efficiency measures how well resources are utilized regardless of scale, whereas scale efficiency assesses whether an organization operates at its optimal size (neither too large nor too small). In the output-oriented model, all centres similarly demonstrated good pure technical efficiency but continued to grapple with scale inefficiencies, especially at Sarawak General Hospital and Hospital Universiti Sains Malaysia.

Conclusion: These findings highlight the importance of optimizing operational scale in OSCCs. Tailoring resource allocation and strengthening coordination among multidisciplinary teams could reduce response times and improve care for DV victims.

KEYWORDS:
Efficiency; effectiveness; domestic violence; OSCC; Malaysia

INTRODUCTION

Domestic violence (DV) is a pervasive global public health issue with significant threats to the well-being and safety of its victims.[1] Globally, 1 in 3 women have experienced some form of physical or sexual intimate partner violence or non-partner sexual violence in their lifetime.[2] The Coronavirus Disease 2019 (COVID-19) pandemic had further exacerbated this problem, leading to a rise in the number of cases.[3] Victims often endure physical injuries, emotional trauma, and sexual health issues, including depression, anxiety, unintended pregnancies, and sexually transmitted infections like HIV.[2,4,5] In Malaysia, domestic violence cases are managed through One Stop Crisis Centres (OSCCs), located in all Emergency and Trauma Departments (ETDs) of Ministry of Health hospitals, which provide integrated multiagency services to victims of DV, sexual assault, child abuse, and neglect.[6]

Despite their critical role, no systematic evaluation of OSCC efficiency and effectiveness has been conducted, leaving important knowledge gaps on human resource utilization, service quality, and outcomes in terms of timeliness of response in these centres in Malaysia. Broadly, efficiency refers to a centre's ability to achieve a specific response time using minimal healthcare resources while maintaining service quality standards, whereas effectiveness is defined as the extent to which level of service quality achieved aligns with the organization's goals.[7-9] Measuring both efficiency (timely operations) and effectiveness (quality services) is crucial for OSCCs, as improved efficiency can enhance management, leading to more effective and sustainable care for DV victims. Hence, this study aimed to investigate the efficiency and effectiveness of selected OSCCs in Malaysia using the Data Envelopment Analysis (DEA) method.

MATERIALS AND METHODS

The non-parametric DEA method evaluated the relative efficiency of different decision-making units (DMUs), represented by the OSCCs in this study, by converting inputs (e.g., resources such as staff and time) into outputs (e.g., service quality and response times).

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Participants
A total of 153 adult domestic violence (DV) victims, aged 18 years and above, who received treatment at three selected OSCCs in Malaysia, i.e., in Sarawak General Hospital (SGH), in Universiti Malaya Medical Centre (UMMC), and in Hospital Universiti Sains Malaysia (HUSM), were consecutively recruited. Victims who were physiologically unstable at the time of recruitment, or who required immediate treatment, were excluded.

Materials
The input and output variables were collected based on data from OSCC records in these 3 centres except for service quality variable. In this regard, service quality was evaluated by the DV victim using the validated OSCC-Qual instrument[10], a 35-item tool that measures seven key dimensions of service quality on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). These 7 key dimensions are: (1) supportive environment, (2) multisectoral coordination, (3) tangibles, (4) professionalism, (5) information provision, (6) competency of staff and (7) attitude of staff.10 The OSCC-Qual instrument was scored separately for each of its seven domains for domain-level analyses of the service quality, with no composite total score calculated.[10]

The input variables of this study were:
- I1: Number of doctors
- I2: Number of nurses
- I3: Number of other personnel (e.g., social workers and police).

The output variables of this study were:
- O1: Total response time (undesirable output, treated as input in some models).
- O2: Service quality, measured using the OSCC-Qual instrument.[10]

Procedure
When a DV victim was admitted to an OSCC and received initial treatment, the attending nurse notified the investigators or their research assistants to initiate data collection. After obtaining informed consent, participants were invited to complete the self-administered OSCC-Qual instrument to assess service quality perceptions. The other input and output data were extracted from OSCC records. The study received ethical approval from the Malaysian Medical Research and Ethics Committee (NMRR-20-1437-54831) prior to commencement of the study.

Specifically, in this study, a widely used variant of DEA, i.e., the Banker, Charnes, and Cooper (BCC) model of DEA, was used as this model allows for the assessment of both technical and scale efficiency, while accommodates for the variations in resource utilization and operational capacity across different DMUs.[11]

Based on Seiford and Zhu's method[12], a two-stage DEA model was conducted where the output (O1) generated based on the inputs (I1, I2 and I3) in the first stage would subsequently become the input of the second stage to generate its output (O2). Therefore, Stage 1 is an input-oriented BCC DEA model to evaluate organization's efficiency in converting inputs into fixed response times, while Stage 2 is an output-oriented BCC DEA model to evaluate the effectiveness of OSCCs in meeting service quality expectations. In this study, although the output O1 in the first stage can be considered as an "undesirable output" (as longer response time means less efficient), it can be treated as an input in performing DEA as shown by lo Storto and Goncharuk.[13] Integrating these models provided a comprehensive perspective on the efficiency of OSCC operations and outcomes, enabling an independent evaluation of input utilization and outcome maximization. This dual approach offers valuable insights to guide decision-makers in identifying areas for improvement and optimizing resource allocation.

Data analysis
Descriptive statistics on the characteristics of the OSCCs and spearman rank correlation analysis to determine the relationships between the various input and output variables were performed using the Statistical Package for Social Sciences (SPSS), version 29.0. Data Envelopment Analysis Program (DEAP) version 2.1 (available for free download from https://economics.uq.edu.au/cepa/software) was used to construct the DEA frontiers under variable return to scale according to the Banker, Charnes and Cooper (BCC) models to determine the pure technical efficiency (PTE), scale efficiency (SE) and overall technical efficiency (OTE) [11]. PTE measures how well a production unit converts inputs into outputs, without considering the scale impact. It is a reflection on how well a unit manages its resources. In this regard, PTE refers to the ability of an OSCC to maximize outputs (e.g., service quality) using a given set of inputs (e.g., staff and time). SE, on the other hand, measures how well a unit is operating at its optimal scale. A unit is scale efficient when its size is optimal, where changing its size (i.e., making it larger or smaller) would make it less efficient. In other words, SE evaluates whether inefficiencies arise from operations being too large or too small relative to their optimal scale. In this regard, SE describes the capacity of OSCCs to operate at an optimal size or capacity. On the other hand, OTE describes the relationship between SE and PTE where SE is the ratio of the OTE score to the PTE score (SE = OTE/PTE) or OTE = SE x PTE. [14]

RESULTS

Table I shows that the observed response times varied widely across the three OSCCs. The social workers unit shows the longest response times at all three centres, particularly in SGH, where the mean response time was 1018.8 minutes and the median was 435.0 minutes. The police unit response times are relatively consistent across the three centres, with all showing a median response time of 60 minutes. Within the specific individual centres, SGH generally had lower response times across most units when viewed alongside the other two centres. However, the social workers unit stands out as a significant outlier, with an extremely high mean response time.

Variations were observed in service quality scores across the three OSCC centres, with HUSM apparently receiving the highest overall scores, as well as in the dimensions of

Table I: Observed Response Time Across Three OSCC Centres

Response Time (in minutes)	SGH			UMMC			HUSM		
	Cases	Mean	Median	Cases	Mean	Median	Cases	Mean	Median
Emergency and Trauma Unit	46	27.3	12.0	51	101.3	30.0	51	35.0	25.0
Radiology Unit	-	-	-	-			2	30.0	30.0
Psychiatry Unit	-	-	-	3	65.0	60.0	50	70.5	50.0
Obstetrics and gynaecology Unit	5	69.0	60.0	7	51.0	51.0	2	297.5	297.5
Ear, Nose and Throat Unit	2	25.0	25.0	1	180.0	180.0	3	35.0	30.0
Surgery Unit	-	-	-	-	-	-	2	17.5	17.5
Cardiothoracic Unit	-	-	-	-	-	-	1	35.0	35.0
Orthopedics Unit	-	-	-	-	-	-	5	37.0	45.0
Ophthalmology Unit	4	68.8	47.0	-	-	-	10	57.5	52.5
Oral and Facial Care Unit	2	125.0	125.0	-	-	-	-	-	-
Social Workers Unit	15	1018.8	435.0	6	122.5	120.0	51	113.2	100.0
Police Unit	25	70.4	60.0	50	60.0	60.0	29	60.0	60.0

Table II: Observed Service Quality Scores Across Three OSCC Centres

Service Quality (in scores)	SGH		UMMC		HUSM	
	Mean	Median	Mean	Median	Mean	Median
Supportive Environment	4.3	4.2	4.0	4.0	4.6	5.0
Multisectorial Coordination	4.2	4.0	3.3	3.0	4.4	4.3
Tangibles	3.5	3.7	3.2	3.3	3.8	3.3
Professionalism	4.4	4.6	4.2	4.3	4.6	4.8
Information Provision	4.2	4.2	4.0	4.0	4.3	4.4
Competency of Staff	4.4	4.6	4.3	4.1	4.5	4.4
Attitude of Staff	3.4	3.3	3.3	3.3	3.5	3.3
Overall Rating	4.4	5.0	4.2	4.0	4.5	4.0
Overall Service Quality	4.2	4.2	3.9	3.9	4.1	4.1

Table III: Result of Spearman rank correlation analysis

Variables	ETD Units				Referral Units			
	Number of personnels		Total Response Time		Number of personnels		Total Response Time	
	Correlation coefficient (r)	p-value	Correlation coefficient (r)	p-value	Correlation coefficient (r)	p-value	Correlation coefficient (r)	p-value
Supporting Environment	-0.005	0.953	-0.138	0.090	0.215	0.008*	0.207	0.010*
Multisectorial Coordination	-0.410	0.001*	-0.209	0.009*	-0.605	0.001*	-0.483	0.001*
Tangibles	0.037	0.650	0.019	0.820	0.038	0.645	0.022	0.788
Professionalism	-0.104	0.201	-0.089	0.272	0.156	0.054	0.136	0.092
Information Provision	-0.095	0.244	-0.057	0.481	0.085	0.295	0.068	0.403
Competency of Staff	-0.078	0.341	-0.033	0.685	0.070	0.387	0.060	0.462
Attitude of Staff	0.096	0.237	-0.131	0.105	0.175	0.030*	0.159	0.050*
Service Quality	-0.133	0.101	-0.113	0.166	-0.003	0.971	0.010	0.898

Notes: Asterisk (*) denotes 5% level of significance. All analyses were conducted using Spearman rank correlation.

Table IV: Integrated Performance Measures for Input-Oriented BCC DEA Model

Units	Input-Oriented BCC DEA Model								
	Overall Technical Efficiency			Pure Technical Efficiency			Scale Efficiency		
	SGH	UMMC	HUSM	SGH	UMMC	HUSM	SGH	UMMC	HUSM
Emergency and Trauma Unit	0.180	0.563	0.102	1.000	1.000	0.365	0.180	0.563	0.279
Radiology Unit	-	-	0.101	-	-	0.522	-	-	0.193
Psychiatry Unit	-	0.362	0.237	-	0.429	1.000	-	0.842	0.237
Obstetrics and gynaecology Unit	0.394	0.298	1.000	1.000	0.674	1.000	0.394	0.442	1.000
Ear, Nose and Throat Unit	0.200	1.000	0.118	1.000	1.000	0.375	0.200	1.000	0.314
Surgery Unit	-	-	0.024	-	-	0.200	-	-	0.118
Cardiothoracic Unit	-	-	0.118	-	-	1.000	-	-	0.118
Orthopedics Unit	-	-	0.124	-	-	0.254	-	-	0.490
Ophthalmology Unit	0.550	-	0.193	0.829	-	0.197	0.664	-	0.984
Oral and Facial Care Unit	1.000	-	-	1.000	-	-	1.000	-	-
Social Workers Unit	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Police Unit	0.069	0.490	0.530	0.600	1.000	1.000	0.115	0.490	0.530
Median score	39.4	52.7	12.4	100.0	100.0	52.2	39.4	70.3	31.4

Table V: Integrated Performance Measures for Output-Oriented BCC DEA Model

	OUTPUT-ORIENTED BCC DEA MODEL		
Centres	**Overall Technical Efficiency**	**Pure Technical Efficiency**	**Scale Efficiency**
SGH	0.533	0.988	0.539
UMMC	1.000	1.000	1.000
HUSM	0.719	1.000	0.719
Median score	71.9	100.0	71.9

supportive environment for victims, multisectoral coordination, tangibles, staff attitude, professionalism, and competency of staff (Table II).

Spearman's rank-order correlation analysis

Spearman's rank-order correlation analysis was performed to determine the correlations between the number of personnel, total response times in ETD units and referral units, and service quality across seven domains (Table III).

The analysis revealed a strong negative correlation between the multisectoral coordination domain of service quality and the number of personnel in ETD units ($r = - 0.410$, $p = 0.001$) and referral units ($r = - 0.605$, $p = 0.001$), as well as total response time in referral units ($r = - 0.483$, $p = 0.001$). Additionally, a weak negative correlation was also observed between multisectoral coordination and total response time in ETD units ($r = - 0.209$, $p = 0.009$).

On the other hand, the supporting environment domain of service quality showed a significant positive correlation with the number of personnel in referral units ($r = 0.215$, $p = 0.008$) and total response time ($r = 0.207$, $p = 0.010$). Additionally, the attitude of staff also showed a significant positive correlation with the number of personnel in referral units ($r = 0.175$, $p = 0.030$) and with total response time ($r = 0.159$, $p = 0.050$). Other service quality dimensions, including tangibles, professionalism, and competency of staff, did not exhibit significant correlations with the number of personnel or total response time.

Integrated Input-oriented and Output-oriented BCC DEA models

Stage 1 – Input-oriented BCC DEA model

Stage 1, an input-oriented efficiency model, assessed the potential for reducing input quantities while maintaining output levels. Table IV shows that most units in all three centres achieved a PTE score of 1.000 but significant scale inefficiencies are evident across various units, as evidenced by SE values below 1.000. Specifically, for Emergency and Trauma unit, SGH and HUSM exhibited poor OTE scores (0.180 and 0.102), while UMMC performed relatively better (0.563) but scale inefficiencies are evident across all 3 centres. For Obstetrics and Gynaecology Unit, although SGH and UMMC achieved full PTE (1.000), but at the same time, these 2 centres also showed scale inefficiencies with SE of 0.394 and 0.442 respectively. For Radiology, Psychiatry and Police units, these units show consistently low OTE and SE scores across all centres.

Stage 2 – Output-oriented BCC DEA model

Both UMMC and HUSM have perfect PTE score of 1.000, although only UMMC achieves an OTE score of 1.000. Although SGH also had a close to perfect PTE score of 0.988, it had the lowest OTE score of 0.533 due to scale inefficiency with SE of only 0.539 (Table V).

DISCUSSION

The response times (both mean and median) vary significantly across the three centres, suggesting differences in operational efficiency or resource availability. Most prominently, the Social Workers Unit shows the longest response times at all three centres, especially in SGH, where the mean response time is 1018.8 minutes, and the median is 435.0 minutes. While the long response times in the Social Workers Unit may initially seem inefficient, they may also reflect the critical and multifaceted role of social workers in addressing the safety, legal, and emotional needs of domestic violence victims. For example, social workers are often responsible for arranging safe and undisclosed temporary shelters for DV victims in order to shield them from further violence, stigmatization, and secondary traumatization.[15,16] This process requires meticulous coordination to ensure the victim's safety and well-being. Additionally, legal processes such as obtaining Emergency Protection Orders (EPOs) or Interim Protection Orders (IPOs) often necessitate extended response times due to the involvement of police and judicial authorities.[6] Further complexity can also arise when victims have young children or babies accompanying them, as social workers must address the needs of both the victim and the child, such as securing essential resources and ensuring emotional support.[17] In this study, for SGH OSCC, the Social Workers Unit data show a mean of 1018.8 minutes and a median of 435.0 minutes, suggesting that the data is skewed to the right. This means that there are a small number of very complex cases (outliers) requiring a lot of social welfare support and interventions.

The correlation analysis revealed a strong negative correlation between the multisectoral coordination domain of service quality and the number of personnel in ETD units, the number of referral units as well as the total response time in referral units. This suggests that an increase in personnel does not necessarily improve coordination, which is critical for ensuring timely responses to DV victims. In fact, paradoxically, this is perceived as a decrease in service quality, potentially due to inefficiencies such as communication breakdowns, overlapping and redundant roles, or lack of clear responsibilities between different teams, which require the repeated need for DV victims to retell their traumatic experiences to different healthcare staff. This repetition can lead to secondary traumatization[15,16], further exacerbating the emotional burden on victims and negatively impacting their perception of service quality.

With regards to Stage 1 (input-oriented) BCC DEA analysis, it was found that most units in all three centres achieved a PTE score of 1.000, indicating that they were efficient in managing inputs to produce outputs regardless of scale inefficiencies. But at the same time, there were significant scale inefficiencies across various units in all 3 centres. In other words, the results indicate that scale inefficiency, rather than the technical inefficiency of resource utilization, was a primary contributor to poor overall efficiency (OTE) in most units. Hence, units with scale inefficiencies need to adjust their scale either by increasing or decreasing resource deployment in order to achieve a more optimized SE.

Similarly, in the Stage 2 (Output-Oriented) BCC DEA analysis, all 3 centres demonstrated excellent PTE scores suggesting that these centres were managing resources efficiently. Their inefficiencies were not due to resource mismanagement or operational workflows but rather scale inefficiencies. Scale inefficiency was the primary factor contributing to differences in OTE, particularly for SGH and HUSM. Both centres should explore strategies to reduce their operational scale, such as redistributing resources, managing patient volumes, as well as improving workflow coordination.

This study has a number of pertinent limitations that need be mentioned. First, the assumption of DEA that all DMUs operate under similar conditions may not reflect real-world variations particularly in healthcare settings. Indeed, the non-homogenous nature of DMUs in hospital settings raises concerns about fair evaluation of all DMUs [18]. Unlike in manufacturing and banking settings where standardized goods and services are produced and rendered under more controlled and repeatable processes, healthcare operates in a highly variable environment. For example, each victim or patient is a unique individual with varying levels of disease complexity. They may present with differing severities of trauma, comorbidities, and treatment and psychosocial needs, making it challenging to standardize inputs (resources) and outputs (health outcomes). Furthermore, unlike factories, where outputs are easily measurable (e.g., the number of goods produced per unit time), healthcare outcomes are multidimensional and include both clinical outcomes (e.g., recovery rates, reduced symptoms) and patient satisfaction (e.g., perceived quality of care). These outputs are harder to quantify and standardize. Hence, efficiency scores derived from models like DEA using measures of inputs (e.g., number of staff) and outputs (e.g., response time or service quality) can be rather simplistic and may fail to fully capture the nuanced processes involved in delivering individualized care. For these reasons, whilst longer response times are typically viewed as inefficiencies, this may not always be so in a healthcare setting. Some extended response times could arise be due to the complexity of the case or the legal procedures associated with the case. Another key limitation specific to this study is that only standardized human resources, such as the number of doctors, nurses and other staff, were captured as input without accounting for other critical resources like infrastructures or other organizational factors that characterize each of the 3 OSCCs. The omission of other non-standardized variables lead into incomplete representation of resource utilisations. Another limitation of this study is its focus on only three OSCC were analysed. This may affect the generalizability of the findings and restricted the number of input and output variables used. Future research perhaps should include a larger number of centres and incorporate contextual factors such as staff training, staff experience, and geographical disparities in access to care, as these elements may influence service delivery and patient outcomes in OSCC centres.

CONCLUSION

A two-stage DEA BCC model conducted to evaluate the relative performance of 3 OSCCs revealed some significant scale inefficiencies although all of them achieved high PTE. Therefore, optimising the operational scale is as important as efficient resource management in OSCC. Efforts to address human resource constraints and enhance service quality are essential to ensure that OSCCs will be better utilized and managed as a safe place to meet the needs of DV victims.

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