

Research Article

In Search of Perfect Embalment Scoring Tool

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Abstract:

Background: Scoring systems for tissue preservation and embalment can be likened to trauma scoring systems for their pivotal roles in healthcare institutions for evaluation and auditing purposes. Albeit, embalment cannot always guarantee exact ante-mortem state, the present study was designed to validate the scoring tool that had been developed in appropriating medical and social needs of embalming practices.

Methods: The study was one-year hospital-based using the standardized forms A, B and C of 'Relative's Perspective Scale of Embalment' for data collection. 'Form A' was self-explanatory and scored by the relatives of the dead. 'Form B' was handled by mortuary director, likewise 'Form C' for auditing. Reliability and descriptive statistics were applied to report the validation outcome data for the Likert-styled Form A. The hypotheses were tested at 0.05 level of significance.

Results: Only 94 out of 129 bodies released within a year were deemed fit for the study (amounting to 73% of the bodies) due to exclusion criteria. Cronbach's alpha reliability score of 0.710 (Acceptable) was recorded. Descriptive statistics further showed mode 33, median 33.5, range 19-45, mean 34.2 ± 6.9 and response score of 76%. Assertion Q8 in Form A was the most reliable.

Conclusion: Offensive odour from the embalming centre needed to be addressed. Final validatory judgement 'RPSE-D' interpreted 'Improve on mortuary operation' rightly projected this scoring tool for evidence based embalment. Some modification exercises suggested because of commercial venture of the mortuary in order to encourage more patronage and consequential acquisition of cadavers for research and medical education.

Keywords: Scoring tool; Cadaver; Embalment; Validation; Relatives; Mortuary.

Introduction

Scoring systems for tissue preservation and embalment can be likened to trauma scoring systems playing a pivotal role in the evolution of trauma care for years but equally remain poorly understood by many care givers (Disner, 1992; Bein and Tueger, 1993; Esposito *et al.*, 1995). It is hereby necessary to validate the scoring tool that had been developed in appropriating embalming practices, even though, embalment cannot always guarantee exact ante-mortem state. Besides, death will always make the body change no matter how expert the embalmers' skills are in addition to **post-mortem** reconstructive surgeries carried out following traumatic deaths.

Broadly speaking, embalming techniques are constantly advancing for both funeral and anatomic categories of embalment; thus, embalmers and relatives/relations of the dead interact on assessment of the dead to achieve mastery of the newer techniques in embalming services. The use of scoring tool for qualitative and quantitative assessments appears synonymous to a scale which is defined as succession in ascending or descending order having a graduated sequence of marks. A scale in this context appears as numerical index

for researchers to identify corroborated observational scoring indices by the relatives (relations). In other words, an index compiles one score from a variety of statements representing a belief, feeling, or attitude while a scale measures levels of intensity at the variable degree with either agreement or disagreement (Crossman, 2019). Albeit, there is no single gold standard for assessing embalming services based on the various geographical, ecological and socio-cultural needs, ordinarily, scoring tools are designed to weigh the various assessment modalities towards gingering the trained workers and the entire stakeholders of any institution in line with acceptable standards. Validation exercises are also projected to serve as evidence-based anatomy towards variations in institutional activities being hypothecated in the numerical index measurement outcomes, in this case - Relative's Perspective Scale of Embalment (RPSE) - if it were to be applied in different embalming centres across the globe. Informatively, the act of embalming practices is now receiving a boost in Nigeria with offering of diploma course in Embalming Techniques and Services thereby assisting the interested individuals coming on board to embalming affairs rather than capitalizing on aged-long practices of amateurish folks with no scientific knowledge of anatomical sciences.

In social sciences, the utility of RPSE can be equated to LinkedIn Social Selling Index (LSSI) score in measuring individual's or company's performance going by the explicates of Chow (2018). LSSI score is a ranking instrument in which improvement of scores will always enhance customer's patronage in creating professional brand, finding the right people, engaging people with insight and building strong relationship. As for RPSE, customer's category will incorporate: relatives of the dead; anatomists needing cadavers for dissection, prosection and exhibition; other researchers utilizing cadavers for diagnostics, therapeutics and historic acquisition. The higher the score of RPSE or LinkedIn the better approval and supports by members of the public who are the principal assessors or consumers as the case may be.

There is paucity of data available online and in published literatures on cadavers' scoring systems or indices despite widespread utility of cadavers in anatomic laboratories and clinical trials. This validity review was designed to evaluate the relative's perceptions of the mortuary services in keeping the 'fallen soldiers' (cadavers, Latin from *cadere* 'to fall.') who have undergone a change of environment as our first indefatigable patients and teachers without underscoring their magnanimity towards their contributions to knowledge in buffering the needs of the living (Cadaver, 2012). There seemed to be no cogent criticism towards embalming practices majorly by unskilled or those who had no scientific knowledge of anatomy in this sovereignty; and perhaps in some other developed countries. Hitherto, relations are beginning to lament, channeling their grievances to faith and wanting to patronize the best embalming centres available in their domains based on finance and cognition. Nevertheless, while there are many opportunities scattered throughout the world to propagate scoring tool for embalment affairs, little consideration has been given to the exercise by both real anatomist and embalmers of good repute. This hospital-based study seeks to formally validate and highlight the essentials of Relative's Perspective Scale of Embalment (RPSE) towards medical and social needs of embalming practices from forefronts of relatives of the dead. Specifically: to describe the development and *modus operandi* of the mortuary based on the assessment from relatives of the dead; to systematically review embalming practices towards projection of RPSE as evidence-based embalment tool in auditing; and to make recommendations on the way forwards in embalming matters towards global best practices.

Body Text

The study was approved for conduction at the Mortuary Complex, Department of Anatomic Pathology of Federal Teaching Hospital, Ido-Ekiti, Southwestern, Nigeria using the standardized forms A, B and C of 'Relative's Perspective Scale of Embalment' as earlier published (Popoola, 2018). 'Form A' was to extract information and be scored by the relatives/relations of the dead after a preferred verbal consent as approved: usually priority was given to whoever was the next-of-kin before considering distant relations, family physicians and attorneys. 'Form B' was handled by Mortuary

Director/Embalmer/Pathologist/Anatomist while 'Form C' was purely for the institution's Registry/Audit Department. The authors searched for scientific articles describing any scoring systems in anatomy and embalment specifically but most of the documented studies were carried out based on history of embalming from ancient Egypt, Peru, Greece, India, China and Jews. The following were engaged: Google, PubMed, and Cochrane databases with the terms: embalming assessment, embalming indices, embalming scoring systems, anatomy scoring indices and the searched for papers that cited any scoring or assessment of the embalmed bodies by either the relatives/relations of the dead and the embalmers/anatomists themselves. There was an infinitesimal utilizable information from all these gestures. Reliability and descriptive statistics were used to report the validation outcome data by evaluating Cronbach's Alpha value, frequencies and percentages for the Likert-styled proforma. The hypotheses were tested at 0.05 level of significance with confidence interval of 95%. Receiver Operating Characteristic (ROC) Curve was employed in describing the morphologic aspect of the data.

Exclusion criteria: All the bodies of minors (age less than 18 years) and some of those who died from unpalatable events in who's the relatives, from psychologic point of view, were not interested in filling the proforma – RPSE Form A were excluded.

Limitation of study: Time of embalment, period of embalment, embalment mixture and specific embalmers were not taken into consideration for sensitivity and specificity study in assessing structure, process and staff functionality just because the scoring tool (RPSE) is more of auditing outcome of embalment from the relatives of the dead as a mirror to appraise the activities of embalming institutions.

Results and Discussion

Results

A total number of 129 bodies was released in the hospital from the beginning of April 2019 to end of March 2020. Only 94 bodies, amounting to (94/129 x 100%) 73% of the total number of bodies, were deemed for the study due to unpredictable exclusion criteria.

Reliability Statistics

Number of items	10
Cronbach's Alpha	0.710 (Acceptable)

Descriptive Statistics

Total number of responder (n)	94
Mode	33
Median	33.5
Sum (s)	3210
Range	19 – 45
Mean (s/n)	34.2
Standard deviation	6.9
Response score (Mean/Maximum x 100%) (Excellent)	76%

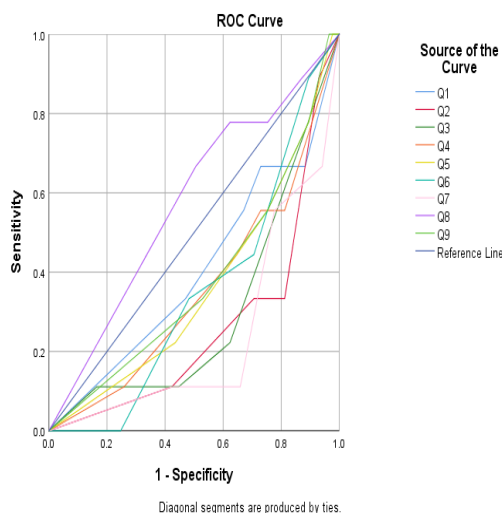
Table 1: Overall scores for respondents (n = 94)

No	Question	Very Low n(%)	Low n(%)	Bargaining n(%)	High n(%)	Very High n(%)
1	Q1	13(13.8)	13(13.8)	6(6.4)	19(20.2)	43(45.8)
2	Q2	7(7.4)	15(16.0)	9(9.6)	26(27.6)	37(39.4)
3	Q3	39(41.5)	16(17.0)	11(11.7)	13(13.8)	15(16.0)
4	Q4	20(21.3)	7(7.4)	8(8.5)	36(38.3)	23(24.5)
5	Q5	2(2.1)	9(9.6)	14(14.5)	30(31.9)	39(41.5)
6	Q6	10(10.6)	20(21.3)	20(21.3)	23(24.5)	21(22.3)
7	Q7	8(8.5)	15(16.0)	14(14.9)	20(21.2)	37(39.4)
8	Q8	12(12.8)	11(11.7)	11(11.7)	11(11.7)	49(52.1)
9	Q9	3(3.2)	8(8.5)	14(14.9)	21(22.3)	48(51.1)
10	Q10	9(9.6)	24(25.5)	14(14.9)	29(30.9)	18(19.1)

Table 2: Kendall's Coefficient of Concordance (KCC)

Recognition of body	Q1	Q6	KCC =	
	1.16	1.39	0.077	
Relationship with relative while alive	Q2	Q3	Q4	KCC =
	2.36	1.60	2.04	0.184
Issues on embalming centre	Q5	Q7	Q8	*KCC =
	2.10	1.90	2.00	0.015
Satisfaction by relative	Q9	Q10	KCC =	
	1.69	1.31	0.195	

*Significant value



Area Under the Curve

Test Result Variable(s)	Area	Std. Error ^a	Asymptotic Sig. ^b	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Q1	.403	.105	.342	.197	.610
Q2	.260	.085	.018	.094	.427
Q3	.300	.091	.049	.122	.478
Q4	.356	.098	.156	.163	.548
Q5	.363	.096	.177	.174	.551
Q6	.352	.083	.145	.189	.515
Q7	.239	.082	.010	.078	.399
Q8	.575	.101	.464	.377	.772
Q9	.380	.100	.237	.183	.577

The test result variable(s): Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9 has at least one tie between the positive actual state group and the negative actual state group.

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

Figure 1: Using Receiver Operating Characteristic (ROC) Curve to test assertions of Q1-Q9 using the final assessment, Q10, as the state variable.

Discussion

Large financial obligations apart from mourning time are being incurred by people keeping their dead ones in mortuaries till disposal in terrestrial, aquatic, aeriform or cremation manner. To our knowledge, this study seems to be the first of its kind validating an assessment tool developed a few years ago to justify the financial expenses from these relations of the dead, and to encourage cadaver acquisition for medical training and research purposes. Ninety-four out of 129 bodies released from the mortuary within a year showed 73% response which in the real sense of it was ordinarily encouraged in generating facts from this locality bearing the numerous challenges from our veritable socio-cultural heritage and religious beliefs. Cronbach's Alpha reliability value of 0.710 interpreted as acceptable was equally exhortative (Gliem and Gliem, 2003).

On the recognition of body, Q1 and Q6 were evaluated using Form A on 'Basically, how good can you recognize the body?' and 'To what extent has your present assessment of the body met the original expectations?'. From the Likert-styled proforma, the 'high' plus the 'very high' values of 66.0% and 46.85% for Q1 and Q6 respectively were noted. Meaning that a certain degree of the relatives was not able to appreciate their loved ones from the embalming practices in the hospital. Could this be due to progressive dark-coloured changes of the integument being caused by formalin which is usually the denominator in all our common embalming fluid in this sovereignty, perhaps, in most developing countries? Nevertheless, the period of embalment and cause of death amongst other factors that were not taking into cognizance by Relative's Perspective Scale of Embalment (RPSE) might be part of the reasons for recognition palaver to questions Q1 and

Q6. For these assertions, a call for modification of another version of the tool in future as suggested by the innovator would be a welcoming advancement in embalming affairs (Popoola, 2018). It is of note the Kendall's Coefficient of Concordance (KCC) value of 0.077 was not significant, thereby accepting null hypothesis, proved the two assertions (Q1 and Q6) to be interrelated in mirroring the minds of the relatives.

Relationship with relative while alive was exemplified by Q2, Q3 and Q4 (as demonstrated in Form A). The Likert-styled 'high' plus the 'very high' values of 67.0% and 62.8% for Q2 and Q4 respectively were antagonistic to 58.5% ('low' plus 'very low') for Q3. It was possible the relatives participating in this scoring exercise might truly not be having direct access to the bodies while the deceased were alive. It was discovered that the relatives who were very espoused to the deceased physical body/anatomy while alive seemed not psychologically stable in wanting to do the scoring for emotional reasons, thereby leaving the extended relations in charge which has always been a social factor right from inception in African traditions. As the KCC was greater than 0.05, null hypothesis was accepted and all the three parameters were unanimously explaining the opinions of major/close relatives.

The Likert-styled 'high' plus the 'very high' values of 73.40%, 60.9% and 63.8% for Q5, Q7 and Q8 respectively representing the opinions of relatives on the issues surrounding the embalming centre were independently noted on this assertion since KCC was less than 0.05 and alternate hypothesis accepted with dicey explanations. Q5 and Q8 were reversely scored unlike Q7 but all having values greater than 50%. The responses from Q5 and Q8 were indicting the centre while that of Q7 was applauding. It is hereby advisable that something positive needed to be done in masking the offensive odour basically from putrefying tissue and dominated formalin. Other means of embalming to reduce these ugly situations may gear up robust understanding between the embalmers and the relatives, and applaudable sanitized ecologic condition.

Satisfaction by relative was independently chancefully explained by Q9 and Q10 with KCC greater than 0.05. The Likert-styled 'high' plus the 'very high' value of 73.4% in Q9 was noted with lesser judgement while that of Q10 was really neither here nor there (50.0% on positive and 35.1% on negative sides of bargaining). The final journey of the dead to disposal includes comprehensive assessment and how fit the physical appearance of the body is for exhibition which is the average attribute (50%) in Q10 from this validity study as almost 15% of relatives were still bargaining. It could then be inferred that the relatives were not strongly gratified with the final quality of bodies representing products from the embalming centre which principally is an integral part of secondary and tertiary healthcare centres. On account of this, cogent measures needed to be taken for the business venture boosting the internally generated revenue as health sector is turning into in this sovereignty. Besides, to enhance cadaver acquisition for medical and research purposes as canvassed in

a previous documentation on body bequeathment matters (Popoola, *et al.*, 2019).

It is a fact that sensitivity is how good the test (scoring system) is at picking out patients (relatives) with disease (true positive opinion) going by the predictive diagnostic test interpretation of Receiver Operating Characteristic (ROC) Curve using computing values of sensitivity and specificity (Metz, 1978). From Figure 1, the only assertion that stood out as the true and most sensitive was Q8 [Do you perceive any odour other than that of embalming fluid (i.e. Formalin, Spirit, Phenol)?]. Highest area under curve (AUC) of 0.575 on the positive side of diagonal line really proved this assertion to be a very essential observation in detecting necrotic to decaying cadaver tissues as preservation of tissue is *sine qua non* to embalment. On this note, it is advantageous to exclude relatives with either anosmia or dysomia from participating in this scoring exercise where necessary since this singular assertion of Q8 is germane to body preservation and embalment where formalin is the denominator of embalming fluid as witnessed in most parts of this country and the likes. Next to Q8 in AUC was Q1 (Basically, how good can you recognize the body?) which might have been influenced by ante-mortem or post-mortem trauma or both amongst other factors like vision impairments. On the contrary, looking at it critically, embalment would have taken care of this issue thereby making Q8 as the most significant concern of embalment.

Concisely, the descriptive statistics showed the mode (33) and the median (33.5) were not far from the mean (34.2 ± 6.9). From Form B of RPSE: index was D, range of score from Form A was 34-41 with percentage score of 60-79 thereby equating to 'Improve on mortuary operations'. Final record then read RPSE-D. Thenceforth, RPSE Form C was filled in readiness for future auditing purposes since only one-year assessment had been performed and improvement of scores will always enhance customer's patronage, in this case, the members of the public who are relatives of the dead (Chow, 2018). Going by the assertions, modification of some activities of the mortuary operation for enrichment might also be entertained as the final score 34.2 was at the lower margin of the range (34-41) for RPSE-D to further encourage cadaver acquisition and commercial venture of the mortuary.

Conclusion

This study has further inaugurated the brevetted need for a scoring tool in embalming affairs. The unbearable and offensive odour from the embalming centre needed to be addressed: an alternative may be sorted for the denominated formalin, the chemical culprit for loathsome odour in most cases, and adequate fixation of tissue to reduce putrefaction. Scoring of RPSE Form A by the relatives, if possible, should solely be affairs for the spouses and first degree relations. Assertion Q8 in Form A was the most reliable of all. The final validity judgement of mortuary operation score in this present study was 'RPSE-D' equating to: 'Improve on mortuary operation' rightly projected Relative's Perspective Scale of Embalment as evidenced based

embalment/anatomy tool in auditing dealings. Suggestively, some modification exercises should be effected towards consequential acquisition of cadavers for research and medical education, and additionally, to encourage more patronage because of money-making venture of the mortuary.

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Ethical Approval: Duly approved.

Informed Consent: This was purely verbal and preferred by relatives.

Contributions: The study was designed by SOP to validate an uncommon scoring tool pioneered a few years ago. SOP also played a central role in other aspects of the study. OOE, the Head of Department of Anatomic Pathology contributed greatly in data collection and discussion. AJO contributed vastly in data collection.

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