THE IMPACT OF A PAN-REGIONAL INCLUSIVE TRAUMA SYSTEM ON QUALITY OF CARE

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INTRODUCTION

As with many areas of modern medicine, the delivery of high quality trauma care is dependent on timely access to specialist expertise and resources. Quality includes the well-timed delivery of expert, appropriately resourced care. Trauma systems are public health models of care that aim to assure access to, and the quality of injury care for their designated population[1 2], which are governed by quality assurance and performance improvement frameworks [3, 4]. While regional systems appear to reduce overall mortality through enhanced resources[5-7] and improved access[1, 8] the specific aspects by which they deliver improved quality are unclear. In particular, the differences between organisational change and clinical delivery of care on overall quality are under reported. This has important implications for the future implementation and evolution of trauma systems.

The 2007 National Confidential Enquiry into Patient Outcome and Death (NCEPOD) reviewed the quality of care of all severely injured patients in England and Wales [9]. Cases were identified over a three-month period and were evaluated by a team of expert advisors. At this time there were no formal regional trauma systems in place in the UK and the report demonstrated inadequacies in the quality of care for 60% of severely injured patients [9]. Three years later in April 2010, the Greater London urban area implemented a contiguous trauma system for a population of 10 million people. The system was designed to be inclusive, with cooperating networks of major trauma centres, trauma units and prehospital care providers. The NCEPOD study described the base-state prior to implementation, therefore this represented a unique opportunity to understand the quality, strengths and weaknesses of organised systems of trauma care. Quality assessment of large scale regionalisation in trauma care has yet to be described although has clear global relevance for healthcare system development.

We wished to evaluate the impact of the implementation of an inclusive pan-regional trauma system on quality of care following severe injury. The primary objective of this study was to assess the quality of trauma care and outcomes following regionalisation. Second, we wished to examine the effect of trauma networks on access for injured patients and the utilization of secondary transfers across the network. Finally we wished to evaluate the degree to which the systems goal of inclusiveness had been achieved across the whole network.

We conducted a prospective cohort study across the London Trauma System (LTS) and compared the results to those in the original NCEPOD study.

METHODS

Study setting

The LTS is geographically divided into four networks and serves the population Greater London (8·3 million people) and a portion of the wider metropolitan area (10 – 12 million people approximately). All of the networks are based on the hub and spoke principle of inclusive regionalised care. Services, processes and resources are subject to designation criteria[10]. Four Major Trauma Centres (MTCs) are responsible for treating the most severely injured patients. MTCs (equivalent to level one centers), are specialty hospitals with a full complement of clinical disciplines available on site. Each MTC is associated with a number of designated trauma units (TUs, approximately equivalent to level three centers). TUs are capable of treating less severely injured patients and able to initiate treatment and onward transfer of those identified as requiring MTC level care. Pre-hospital distribution of patients is coordinated via a pan-London triage tool. Pre-hospital care is provided by the London Ambulance Service in cooperation with regional boundary ambulance services augmented by physician-led emergency medical teams (land and helicopter). Pre-hospital physicians are tasked to trauma requiring a greater level of care at scene, such as rapid sequence induction of anesthesia.

Data collection

Evaluation of the London Trauma System (ELoTS) utilised the core methodology described in the NCEPOD report [9]. For the three month period from February to April 2013, all trauma patients (adult and paediatric) were identified prospectively within all MTCs and TUs across each network. Patient case notes from prehospital care through to hour 72 of hospital admission (or death) were copied, anonymised and securely stored at each network MTC. Internal review board approval for service evaluation was agreed and data were collected as part of institutional clinical audit. The primary inclusion criteria was severe injury, defined by an injury severity score (ISS) of greater than 15 utilising Abbreviated Injury Score (AIS 98) coding [11]. This was calculated locally and verified with the Trauma Audit Research Network (TARN: www.tarn.ac.uk). Patients were excluded if they were found to have an ISS<16; a non-trauma patient or if there was a delay in presentation of >72 hours from injury (primarily due to repatriation from other facilities in the UK or overseas). In order to assess improvement to timely resuscitation and early diagnosis, data were collected on demographics, mechanism of injury, prehospital care, trauma team response, time to consultant review, time to diagnostic imaging and operative intervention and any inter-hospital transfer arrangements in the first 72 hours. Traumatic brain injury (TBI) was the most common severe injury reported by NCEPOD; therefore we specifically examined time to neurosurgery consultation and emergency neurosurgery. The effects of system care on outcome, namely early mortality was evaluated (defined as per the NCEPOD study criteria as a death ≤72 hours from admission to hospital). Assessment forms from the original NECPOD audit, comprising quantitative and qualitative measures of care were completed for each patient enrolled in the study.

Assessment of Quality of Care

Previous NCEPOD study expert reviewers and representatives from TARN were invited to participate as quality assessors. A multidisciplinary group of eight independent external experts (from outside the LTS) and twenty one peer reviewers was convened. The panel for each network evaluation was comprised of expert and peer reviewers external to that network to mitigate any reporting bias. Anonymised case notes and assessment forms were evaluated using quality performance indicators derived from the NECPOD study. To enhance inter-assessor reliability, standardised NCEPOD assessment criteria were used for each anonymised case. Panels at each network assessment were encouraged to discuss cases to increase concordance and agree quality grade consensus.

To assess the overall care for each patient a grading system was developed based on the original NCEPOD criteria:

1. **Good care** - A standard that you would accept from yourself, your trainees and your institution.
2. **Clinical deficits** - aspects of clinical care could have been improved.
3. **Organisational deficits** - aspects of organisational care could have been improved.
4. **Deficits in both** - aspects of both clinical and organisational care could have been improved.

5. **Less than satisfactory** - several aspects of clinical and/or organisational care were less than satisfactory, well below that you would accept from yourself, your trainees and your institution.

Data analysis

ELoTS data were compared with that from the NCEPOD study. Time-based raw data were unavailable from NCEPOD thereby preventing any direct comparative statistical analysis. Where available, summary data from the NCEPOD 'Trauma Who Cares' report [9] were used for comparison with ELoTS. Categorical variables were analysed using Fisher's exact or Chi Square tests and reported as percentage and relative risk (RR) with 95% confidence intervals. Consistent with NCEPOD data, age is expressed as mean, and other numerical non-parametric data are expressed as median with interquartile range. Internal consistency of the quality rating across the MTCs was measured using Cronbach's Alpha.

In addition to overall system performance we compared quality and performance at major trauma centres (MTC-ELoTS) with similar high volume hospitals in NCEPOD (HV-NCEPOD). High volume centres were previously defined by NCEPOD as those large multi-specialty hospitals with on-site neurosurgical facilities who reported greater than 20 cases during the study period. All four hospitals which subsequently became MTCs participated in the original NCEPOD research. For this analysis NCEPOD provided summary data on overall quality assessment, injury severity, mortality, time to assessment and intervention. Statistical analysis was performed using SPSSv.21, IBM Corp. A p value of $<0{\cdot}05$ was considered statistically significant.

RESULTS

During the three month study period, 344 severely injured patients were identified as suitable for inclusion. Following application of exclusion criteria and removal of cases with missing medical notes there were 321 cases with ISS>15 available for quality assessment. 269 (84%) patients were admitted directly to an MTC and 52 (16%) patients were triaged initially to Trauma Units and then secondarily transferred to an MTC. Demographics of enrolled patients are detailed in Table 1. In comparison with NCEPOD, ELoTS patients were older and had increased use of pre-hospital physician trauma teams i.e. Helicopter Emergency Medical Services (HEMS) (Table 1).

Quality Assessment

Overall, patients in the London Trauma System received a significantly higher quality of care than described in NCEPOD. There was a significant increase in the number of patients categorised as receiving 'Good overall care' (NCEPOD: 48% vs. ALL-ELoTS: 69%, RR 1.3 [1.2 to 1.4], p<0·001). Improvements were evident in all categories of assessment (Figure 1A), with greatest benefit observed in the reduction of organisational deficits (NCEPOD: 23% vs. All-ELoTS: 10%, RR 0.43 [0.30 to 0.61], p=0·02). Good care was higher in MTCs compared to HV-NCEPOD hospitals (HV-NCEPOD: 58% vs. MTC-ELoTS: 74%, RR 1.2 [1.0 to 1.4], p=0.02), with increases in the quality of patient management seen across all categories (Figure 1B). There was good internal consistency between quality ratings across the networks (Cronbach's Alpha 0.76).

Processes of care

Considerable improvements were observed in the initial assessment of injured patients on arrival at the ED, with a significant increase in trauma team response (NCEPOD: 60% vs. All-ELoTS: 92%, RR 1.5 [1.4 to 1.6, p<0·001, Figure 2A). This was further enhanced for severely injured patients taken directly to an MTC, with a near universal trauma team response (HV-NCEPOD: 73% vs. MTC-ELoTS: 99%, RR 1.3 [1.2 to 1.5], p<0·001, Figure 2A). Early involvement of senior clinicians was greatly improved with a three-fold increase in consultant-led trauma teams (NCEPOD: 27% vs. All-ELoTS: 88%, RR 3.2 [2.8 to 3.6], p<0·001). The majority of patients were seen by a consultant in the ED within 30 minutes of arrival (NCEPOD: 38% vs. All-ELoTS: 92%, RR 2.4 [2.2 to 2.6], p<0·001, Figure 2B) with even more marked improvements evident at MTCs (HV-NCEPOD: 57% vs. MTC-ELoTS: 97%, RR 1.3 [1.1 to 1.6], p<0·001, Figure 2B).

In this study approximately one in four patients (22%) was in shock (defined as systolic BP ≤90mmHg) on arrival. When used in early hemorrhage assessment, average time to whole body CT from ED arrival was reduced by two thirds (NCEPOD: 138 mins vs. All-ELoTS: 52 mins, Figure 2C). Pre and post implementation of the LTS, 14% of patients required emergency hemorrhage control (operative or interventional radiology) but following trauma system implementation substantial reductions in time to laparotomy from ED arrival were observed (NCEPOD: 384 minutes vs. median All-ELoTS: 47 minutes (IQR 29-88) [no comparative raw NCEPOD data available], Figure 2D).

TBI was suspected in the majority of ELoTS patients (82%), mandating urgent neurological assessment. There were non-significant increases in utility of CT head scanning (NCEPOD 68% vs. All-ELoTS: 77%, p=0·20) with a median time to CT head scan of 33 minutes (IQR 21 to 56) for All-ELoTS patients (no comparative time-data availability for NCEPOD). Within the LTS, patients presenting initially to a TU had significantly longer waits for CT Head compared to those taken directly to an MTC (TU: 118 minutes vs. MTC: 38 minutes, p<0·001, Figure 3A). Additional benefits were seen at MTCs, with a three-fold increase in CT head within one hour of arrival (HV-NCEPOD: 28% vs. MTC-ELoTS: 82%, RR 2.9 [2.2 to 3.8], p<0·001, Figure 3B). Compared to NCEPOD, significantly more patients were referred for urgent neurosurgical opinion (NCEPOD: 32% vs. All-ELoTS: 55%, RR 1.7 [1.4 to 1.9], p<0·01). Time to neurosurgical review improved with a four-fold increase in specialist consultation within one hour of referral (NCEPOD: 10% vs. All-ELoTS: 45%, RR 4.4 [3.5 to 4.6], p<0·001, Figure 3C), with significant differences observed for those patients admitted directly to an MTC (HV-NCEPOD: 23% vs. MTC-ELoTS: 48%, RR 2.2 [1.6 to 3.1], p<0·01). All MTC patients requiring urgent neurosurgery were operated on within four hours from arrival in comparison to 67% of those patients treated at NCEPOD hospitals with neurosurgery on-site, (RR 1.5 [1.3 to 1.6], p<0·001, Figure 3D).

Mortality

To substantiate the overall quality improvements, the effect on early mortality (within the first 72 hours) was evaluated. Of the 22 deaths observed, 19 occurred within the first 24 hours post admission, two patients died between 24 and 48 hours and one death occurred just prior to 72 hours. The primary causes of death were TBI (16), haemorrhage (4) and severe crush injury (2). Overall early unadjusted mortality rates in the LTS were reduced in comparison to NCEPOD (Figure 4). We observed improved early survival for all degrees of injury, with greatest benefits seen in the most critically injured patients (ISS>35) where crude mortality rates decreased by more than half for ELoTS patients (NCEPOD: 31% vs. All-ELoTS 11%, RR 0.37 [0.33 to 0.99], p=0.04). Similar trends in mortality benefits were seen for patients treated directly at MTCs, where early deaths decreased by nearly half (HV-NCEPOD: 13% vs. MTC-ELoTS 7%, RR 0.53 [0.28 to 0.99], p=0·06).

Access to Care & Inclusivity

Following system implementation, access to early specialist trauma care increased, with 84% of severely injured patients taken directly to a MTC in contrast to 16% in the NCEPOD study. There was a trend toward fewer patients (n=52) requiring a secondary transfer from a TU compared to NCEPOD (NCEPOD: 24% vs. All-ELoTS: 16%, RR 0.67 [0.51 to 0.89], p=0.21). Multisystem injury (78%) or patients with TBI requiring neurosurgical consultation (18%) accounted for the majority of secondary transfers. Significant improvements were observed in the receiving institutions with 90% of cases accepted by a consultant grade doctor, compared to 18% in NCEPOD (p<0·001).

Inclusive trauma systems are responsible for the management of all patients, regardless of whether they are taken to an MTC or TU initially. In ELoTS, data derived from TARN demonstrated that 98 patients with ISS>15 remained at TUs. Data capture from this cohort of patients was poor with few case records made available to the study team. We were therefore unable to fully assess the impact of regionalisation for patients who remained at a TU without transfer to the regional MTC. From the data available, the median age of patients who remained at a TU post-injury was 82 (IQR: 60-91) and the predominant injury for this cohort was TBI. For patients who were transferred, similar quality improvements seen at MTCs were not observed to the same extent in those patients who were treated at a TU initially (Table 2).

Further analysis of trauma care quality assessment revealed broad differences in the categories of observed deficit between patients seen initially at TUs and those presenting directly to MTCs (Table 3). Poor or incomplete documentation was noted for one in ten cases at MTCs and 8% of patients had room for improvement in one aspect of clinical management. In the available TU case notes, one third of patients were reported to have had deficits in care resulting from either a lack of senior decision making or clinical care (Table 3).

DISCUSSION

The effects of public health systems on the quality and delivery of care are difficult to evaluate as baseline assessments are rarely available. We have shown that institution of a regional trauma is associated with significant improvements in the overall quality of care for patients treated at MTCs, and that this is almost exclusively due to organisational change. Improvements in the timely delivery of specialist multidisciplinary care were associated with increased survival. However, decreased time-to process measures such as haemorrhage control may be related to improvements in access rather than specific clinical decision making. The system model did not appear to directly reduce deficits in the clinical aspects of care, and there was a suggestion of increased inequality of access across the region with improvements in quality and data availability in MTCs not observed in TUs. Nevertheless, the implementation of a large inclusive regional trauma system has resulted in demonstrable care quality and outcome benefits for the majority of severely injured trauma patients.

Previous retrospective pre- and post-analyses of an inclusive trauma system reported significantly reduced in-hospital mortality, specifically for those with minor injuries and for patients over the age of 70 years [12]. Three years after implementation, system improvements were associated with improved early mortality for severely and critically injured patients, however further benefits of the network are as yet unknown. It is important to go beyond mortality and look at other sensitive measures of outcome and system successes. In order to do this, expert and peer assessment may be more valuable than measuring processes of care and key performance indicators, as it allows a closer, broader evaluation of patient pathways and care. There were expectations that the London Trauma System would lead to improved clinical quality however this wasn't automatically seen at the three year time point after implementation.

LTS was designed as an inclusive system, which theoretically should reduce inequalities caused by access issues and variations in standards of care. Trauma system quality guidance primarily focuses on resources at MTCs [13], yet clearly TUs have an important role to play. Access to data at TUs was very limited but where available, did suggest the beneficial effects on care quality seen at MTCs were not observed for patients seen initially in TUs. This observation requires further detailed study to evaluate the effect of volume on care post system implementation [14] and potential for unfamiliarity with clinical protocols, reduced engagement or an unintended exclusive approach to trauma care within the network. In an exclusive trauma system only those acute care hospitals with the most resources are designated as trauma centres[15, 16]. Evaluation of exclusive systems suggests that whilst they are cheaper, quality and outcomes are reported to be worse than inclusive systems [15, 17-19]. Data available from TUs when compared to lower volume (LV)-NCEPOD suggest that within LTS there exists a degree of system exclusivity with the potential to impact on quality of care. Further work is required across the system as a whole to explore this effect and how it may be mitigated.

There are several limitations to this study which principally relate to availability of data. First, we acknowledge that we were unable to compare the LTS with data from London-only hospitals within the NCEPOD study. The primary objective was not to directly compare specific hospitals but rather evaluate the quality of an organised system of trauma care against the pre-existing standard demonstrated in the 2007 report, however we recognise the potential differences in populations. Implementation of regional trauma systems across England and Wales since 2010 has largely been based on the London model and therefore we hope that findings from the LTS will have direct relevance for other network evaluation. Second, we could not access all of the records for patients who remained at TUs during the study period. A complete evaluation of quality was therefore only possible for TU patients transferred to an MTC or admitted directly to an MTC and the impact for those remaining at TUs is uncertain. According to TARN, 49% of injured patients in the UK were managed entirely outside of MTCs in 2013, and this figure may be under-reported given data incompleteness nationally (personal communication F Lecky, TARN). The missing ELoTS TU data does impact on the interpretation of the study findings and requires further evaluation a national level. Third, there was the potential for inter-assessor variability although we aimed to reduce this risk through utilisation of the same core NCEPOD assessment criteria during the quality review with emphasis on discussion between grading assessors to improve concordance. Finally, cause and effect cannot be attributed from this observational study. Quality and outcome benefits associated with regionalisation may have arisen from other changes in clinical practice e.g. use of tranexamic acid or introduction of hemorrhage protocols, although therapeutic advances in trauma care are more likely to be available initially within MTCs.

In summary, we have assessed the effect of a regional inclusive system on the quality of trauma care and demonstrated clear improvements which translate to tangible patient outcomes. Inclusive trauma systems appear to deliver quality through organisational change, but may not automatically lead to a reduction in preventable errors or improvements in clinical care. Robust system wide performance improvement programmes with quality assurance, multidisciplinary education and on-going trauma training for MTCs and TUs are required to avoid clinical variance and provide optimal care for all injured patients. Three years after implementation of the LTS, we have shown substantial improvements in the quality and processes of trauma care which are associated in reduced mortality following severe injury in patients treated at MTCs.

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Table 1. Admission demographics and injury characteristics

	NCEPOD (n=795)	All-ELoTS (n=321)	HV-NCEPOD (n=129)	MTC-ELoTS (n=269)
Age	40	46	-	44
Male	594 (75)	234 (73)	-	198 (74)
Mode of arrival				
Ambulance service	652 (83)	197 (61)**	76 (59)	147 (55)
Helicopter service	92 (12)	119 (37)**	37 (29)	119 (44)*
Other	51 (5)	5 (2)	16 (12)	3 (1)
PHC activation to ED (mins)				
Ambulance service	56	61	-	66
Helicopter service	78	72	-	70
ED arrival time				
08.00 - 17.59	344 (43)	163 (51)	-	117 (43)
18.00 - 07.59	419 (53)	158 (49)	-	152 (57)
Injury severity				
ISS 16-24	449 (57)	175 (55)	56 (43)	148 (55)
ISS 25-35	279 (35)	112 (35)	60 (47)	90 (33)
ISS 36-75	67 (8)	34 (10)	13 (10)	31 (12)

Values are expressed as mean or n (%).HV: high volume, MTC: major trauma centre, PHC: Prehospital care; ED: Emergency Department; mins: minutes; ISS: Injury Severity Score. Other includes self-presentation and police/other emergency services. Data on patient demographics e and PHC times for HV-NCEPOD patients not available. **p<0.001, *p=0.03, Fishers exact tests between NCEPOD and All-ELoTS, and HV –NCEPOD and MTC-ELoTS

Table 2. Overall quality assessment: NCEPOD vs. ELoTS TU patients

	Good	Clinical deficits	Organisational deficits	Deficits in both	Less than satisfactory
All-NCEPOD (795)	380 (48)	129 (16)	180 (23)	65 (8)	41 (5)
LV-NCEPOD (668)	306 (46)	112 (17)	154 (23)	60 (9)	36 (5)
TU-ELoTS (52)	20 (39)	11 (21)	9 (17)	9 (17)	3 (6)

Values are expressed as n (%). LV: NCEPOD hospitals not included in the high volume cohort. TU: trauma unit , chi squared analysis between low volume and trauma units not significant for any quality category.

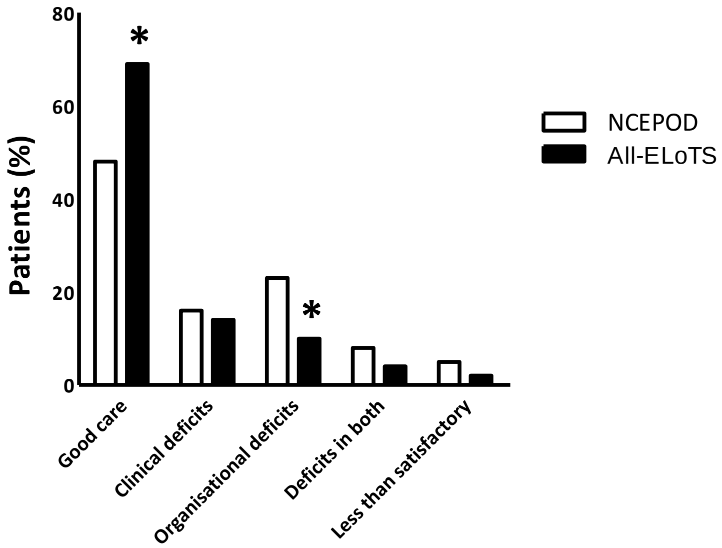
Table 3. Clinical and organisational deficits

Identified deficits	TU (52)	MTC (269)
Senior review/decision making	15 (29)	13 (5) *
Diagnostic imaging delays	7 (13)	13 (5) *
Poor documentation	6 (12)	27 (10)
Transfer/admission delays	7 (13)	3 (1) *
Clinical issues	17 (33)	22 (8) *
Initial assessment delays	*6 (12)*	*2 (1) **
Airway and respiratory management	*3 (6)*	*6 (2)*
Hemorrhage control delays	*4 (8)*	*4 (1) **
C-spine clearance and MSK management	*0*	*6 (2)*
TBI assessment delays	*4 (8)*	*0 **
Other	*0*	*4 (1)*

Values are expressed as n (%). TU: Trauma unit; MTC: Major trauma centre; MSK: Musculoskeletal; TBI: Trauma brain injury. * p<0·01

Figure 1. Overall quality assessment

A



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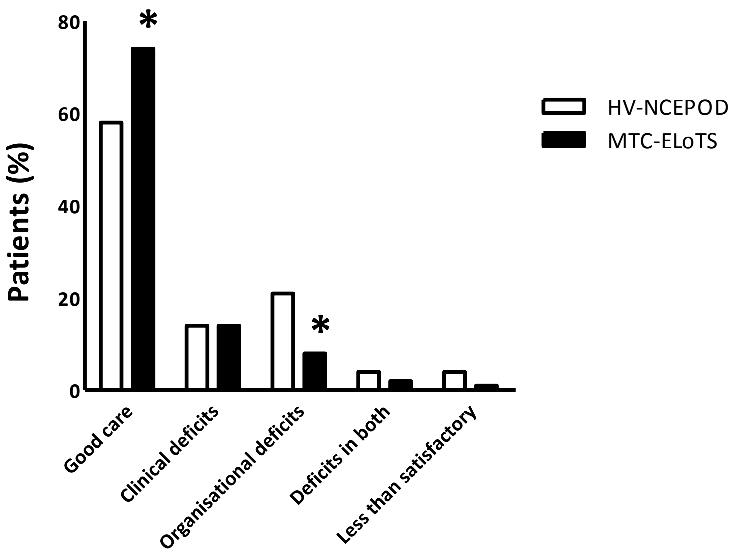

Figure 1 (A) Overall quality assessment: NCEPOD vs. All-ELoTS. Graphs show percentage of cases per quality grade. Good care: NCEPOD: 48% vs. ALL-ELoTS: 69%, RR 1.3 [1.2 to 1.4], p<0.01. Organisationsal deficits: NCEPOD: 23% vs. ALL-ELoTS: 10%, RR 0.43 [0.30 to 0.61], p=0.02. (**B) Overall quality assessment: HV-NCEPOD vs. MTC-ELoTS.** Graphs show percentage of cases per quality grade. Good care: HV-NCEPOD: 58% vs. MTC-ELoTS: 74%, RR 1.2 [1.0 to 1.4], p=0.02). Organisationsal deficits: HV-NCEPOD: 21% vs. MTC-ELoTS: 8%, RR 0.35 [0.39 to 0.71] p=0.01.

Figure 2. Process of care

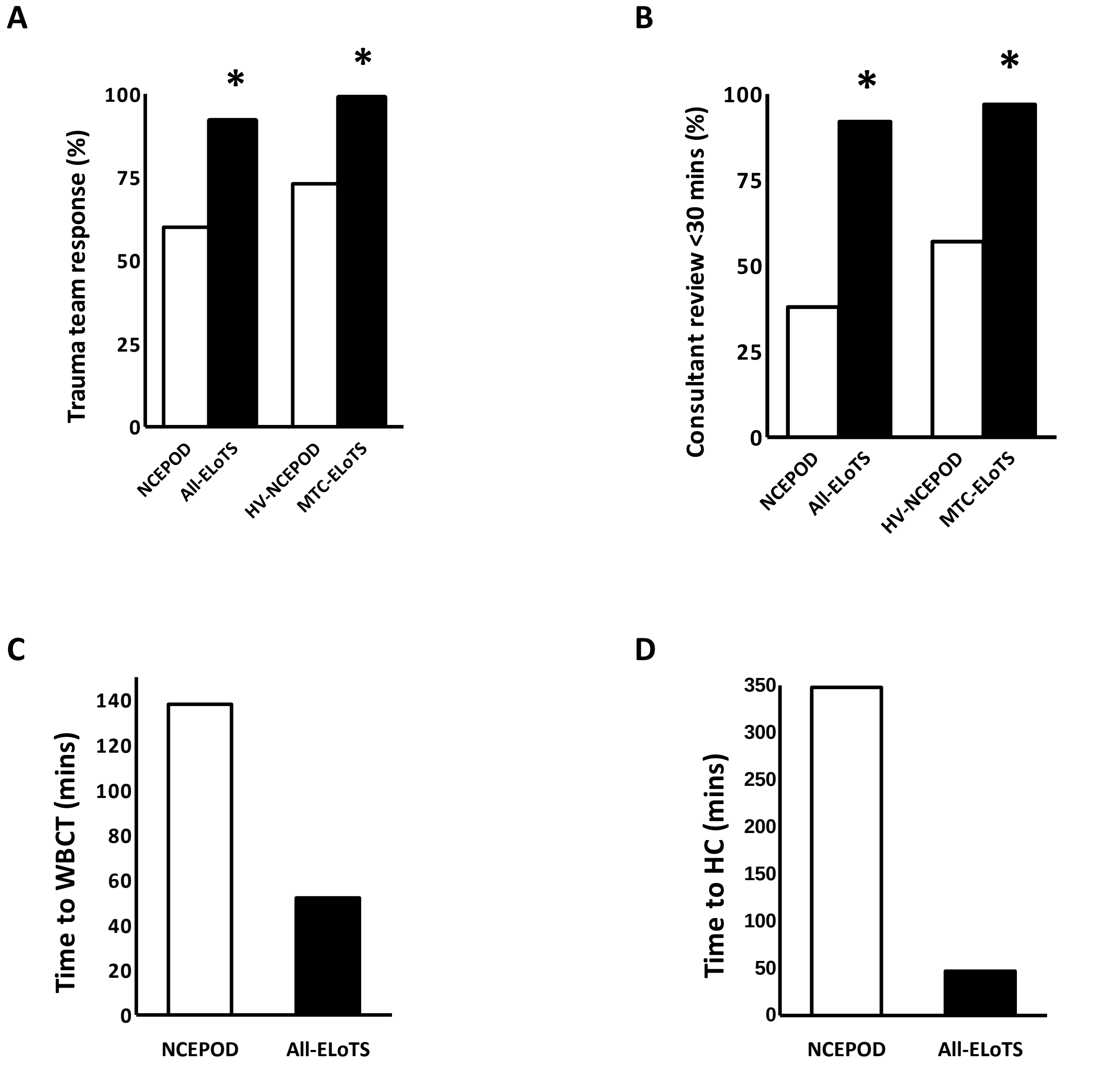

Figure 2 (A) Trauma team response. Graph shows percentage of cases per trauma team response, NCEPOD: 60% vs. All-ELoTS: 92%, RR 1.5 [1.4 to 1.6, p<0.001; HV-NCEPOD: 73% vs. MTC-ELoTS: 99%, RR 1.3 [1.2 to 1.5], p<0.001**. (B) Early consultant review.** Graph shows percentage of cases reviewed by a consultant or attending grade doctor within 30 minutes of arrival, NCEPOD: 38% vs. All-ELoTS: 92%, RR 2.4 [2.2 to 2.6], p <0.001; HV-NCEPOD: 57% vs. MTC-ELoTS: 97%, RR 1.3 [1.1 to 1.6], p<0.0001. (**C) Time to whole body CT (WBCT) scan.** Graph shows average time to CT scan from arrival, NCEPOD: 138 mins vs. All-ELoTS: 52 mins. **(D) Time to haemorrhage control (HC).** Graph shows average time to operative or radiological haemorrhage control from arrival, NCEPOD: 384 mins vs. All-ELoTS: 47 mins. ***For figures 2C and 2D, raw time-process data not available from NCEPOD precluding statistical comparison with ELoTS***.

Figure 3. Process of care for traumatic brain injury

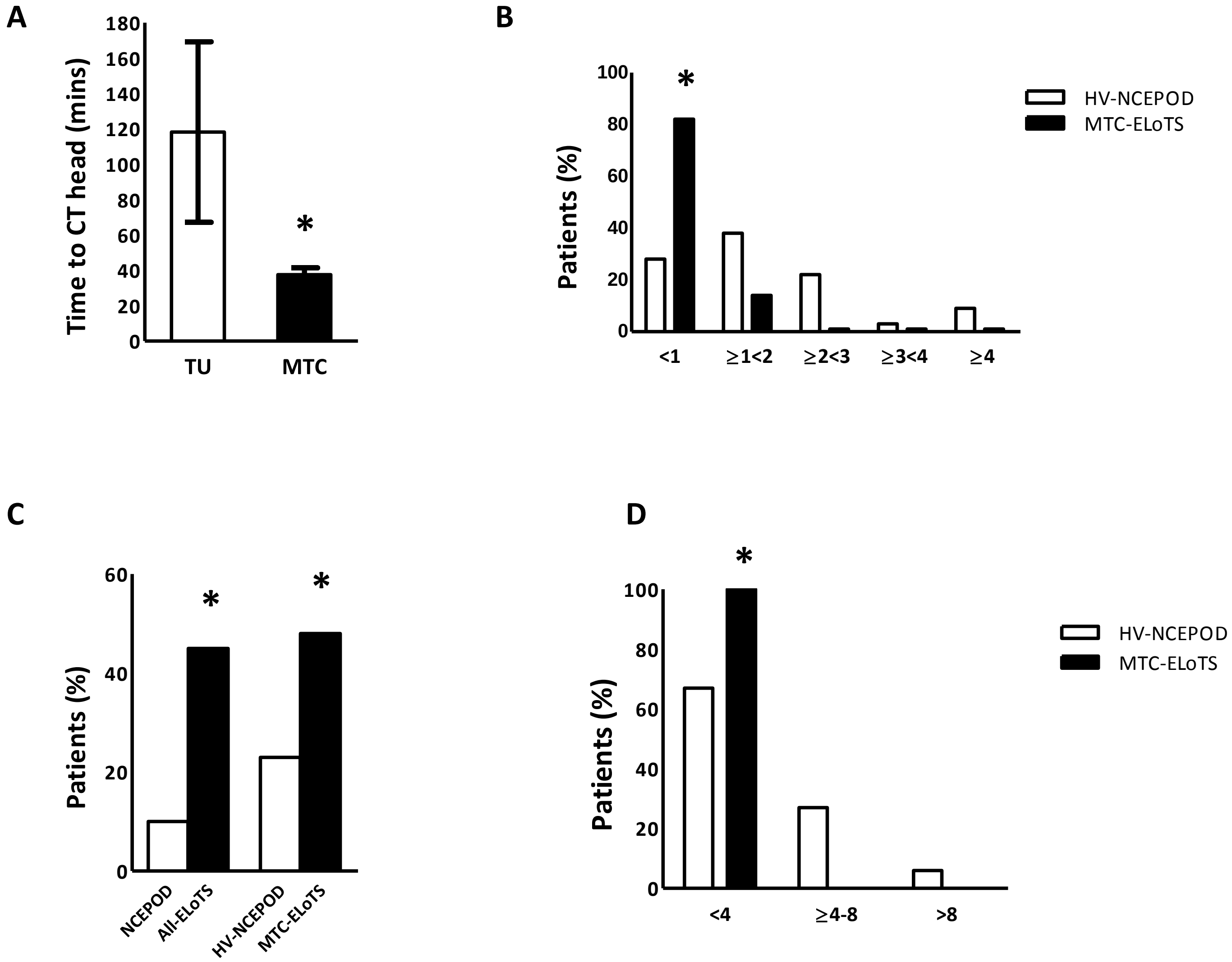

Figure 3 (A) Time to CT head. Graph shows average time to CT scan from arrival (95% CI) at ELoTS TU and MTC, TU: 118 mins (67 to 169) vs. MTC: 38 mins (34 to 42), p<0.001**. (B) Time to CT head – high volume vs MTC.** Graph shows time to CT head per percentage of patients. Patients scanned within one hour from arrival, HV-NCEPOD: 28% vs. MTC-ELoTS: 82%, RR 2.9 [2.2 to 3.8], p<0.001. (**C) Time to early neurosurgical review.** Graph shows percentage of patients receiving neurosurgical review within one hour from arrival, NCEPOD: 10% vs. All-ELoTS: 45%, %, %, RR 4.4 [3.5 to 4.6], p<0.001; HV-NCEPOD: 23% vs. MTC-ELoTS: 48%, RR 2.2 [1.6 to 3.1], p<0.001. (**D) Time to urgent neurosurgery.** Graph shows time to urgent neurosurgical intervention from arrival. Emergency operation within one hour: HV-NCEPOD: 67% vs. MTC-ELoTS: 100%, (RR 1.5 [1.3 to 1.6], p<0.001.

Figure 4. Mortality

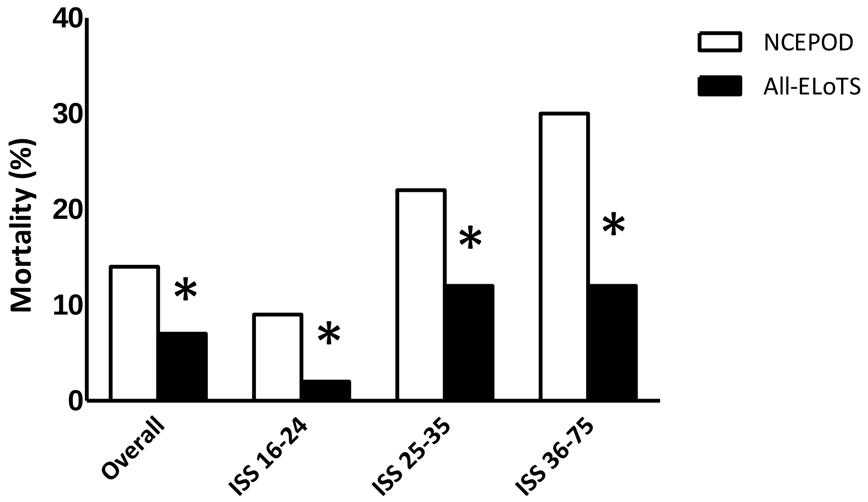

Figure 4. Outcome at 72 hours NCEPOD vs. All-ELoTS patients. Graph shows mortality within 72 hours from arrival.

Overall: NCEPOD: 15% vs. All-ELOTS: 7%, RR 0.46 [0.29 to 0.71], p<0.01; **ISS 16-24**: NCEPOD: 8% vs. All-ELOTS:2%, RR 0.27 [0.09 to 0.79], p<0.01; **ISS 25-35**: NCEPOD: 22% vs. All-ELOTS:13%, RR 0.56 [0.33 to 0.97], p=0.03; **ISS 36-75**: NCEPOD: 31% vs. All-ELOTS 11%, RR 0.37 [0.33 to 0.99], p=0.04.