Letter to the Editor: Impact on 30-day survival of time taken by a critical care transport team to reach the bedside of critically ill children

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To the Editor:

Following centralisation of paediatric intensive care in England and Wales, nearly 5000 critically ill children are transported from local hospitals to paediatric intensive care units (PICUs) annually. The majority of transports are performed by ten regionally based paediatric critical care transport teams (PCCTs) [1]. As arrival of the PCCT represents the first interaction these children have with specialist paediatric critical care, a key standard set by the national Paediatric Intensive Care Society (PICS) [2] is that a PCCT should arrive at the child's bedside within three hours of agreeing they require PICU admission (referred to as 'time-to-bedside').

The 'time-to-bedside' standard was decided by expert consensus, rather than scientific evidence, aiming to improve outcomes. It is possible that shorter or longer times to bedside might further alter patient outcomes. The DEPICT Study (Differences in access to Emergency Paediatric Intensive Care and care during Transport) is a mixed-methods study of paediatric transport in England and Wales, with the aim of investigating how access to emergency care influences the outcomes of critically ill children transported to PICU. In this brief report, we present initial findings investigating the impact of time-to-bedside on 30-day mortality after admission to PICU.

The DEPICT Study used three years of individual level data related to emergency transports to PICU from 1/1/2014 to 31/12/2016 in England and Wales. Full details on the data sources, linkage and the analyses are available in our published protocol: [3]. For children transported more than once, we used the data related to their final transport in the time window. In total, there were 9,116 children transported to a PICU, and the PCCT arrived within three hours 87% of the time.

We fitted a logistic model that accounted for key confounders selected by our clinical team: age of the child; Paediatric Index of Mortality 2 (PIM2) score [4]; clinical diagnosis; ventilation status at the time of transport request; whether the child was receiving critical care and a proxy for the size of the referring hospital. After adjustment, all confidence intervals for time-to-bedside contained the point of no difference (odds ratio of one) and there was no suggestion of an increasing or decreasing trend between time-to-bedside and 30-day mortality (Figure 1). We undertook a robust sensitivity analyses of our findings and investigated if the results remained consistent in pre-defined subgroups (see Supplementary Material).

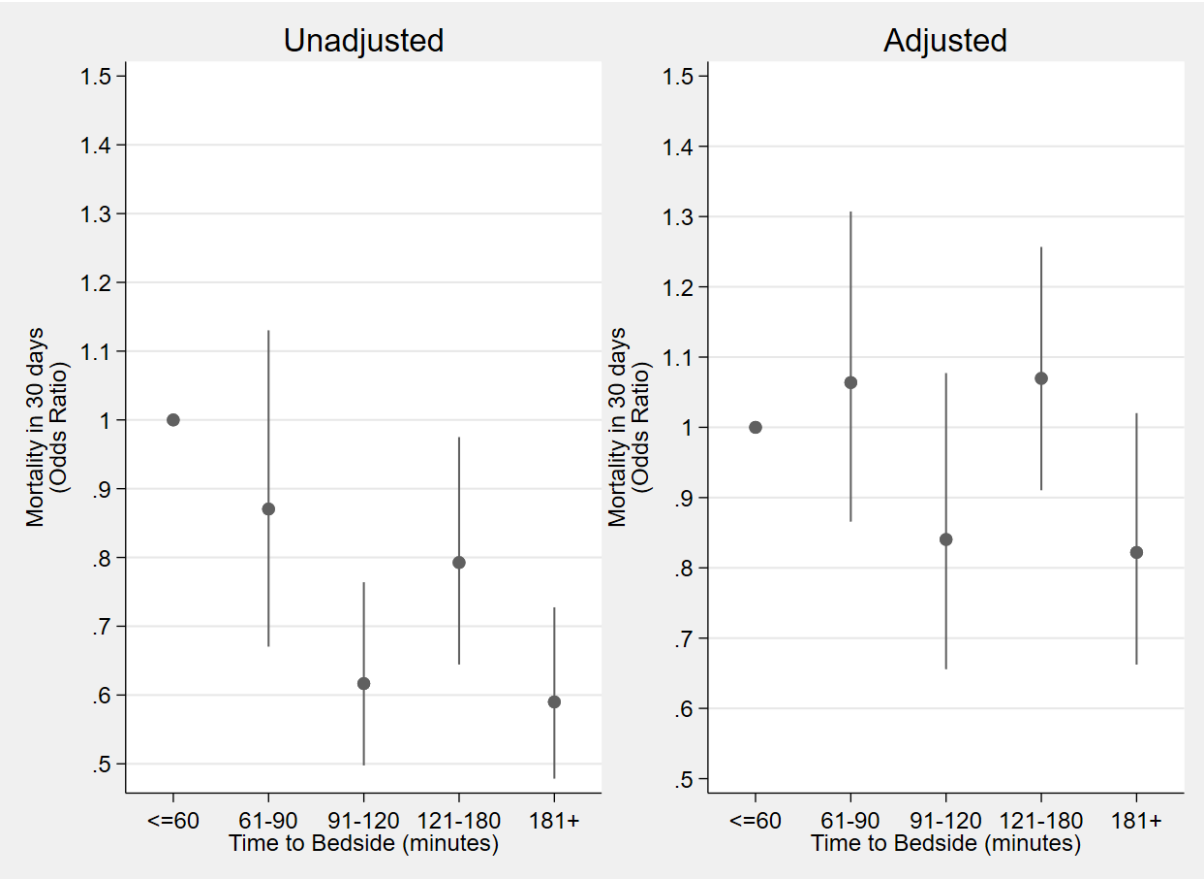
From this work, we draw some cautious conclusions. The time-to-bedside target was met in the majority of cases, so we are unable to definitely conclude whether the target can be relaxed further due to the small numbers of children waiting longer than three hours. However, our results provide

evidence that reducing the time target further would not offer a benefit with regards to 30-day outcome and would potentially involve significant service reconfiguration [5].

In the immediate future, we plan to publish a full report on our primary analysis, including mortality at alternative time points and secondary outcomes including healthcare utilisation (e.g. length of PICU stay).

Figure 1: Unadjusted (left) and adjusted (right) odds ratios of 30-day mortality by time-to-bedside.

Note: ≤60 minutes is the reference category.



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SUPPLEMENTARY MATERIAL

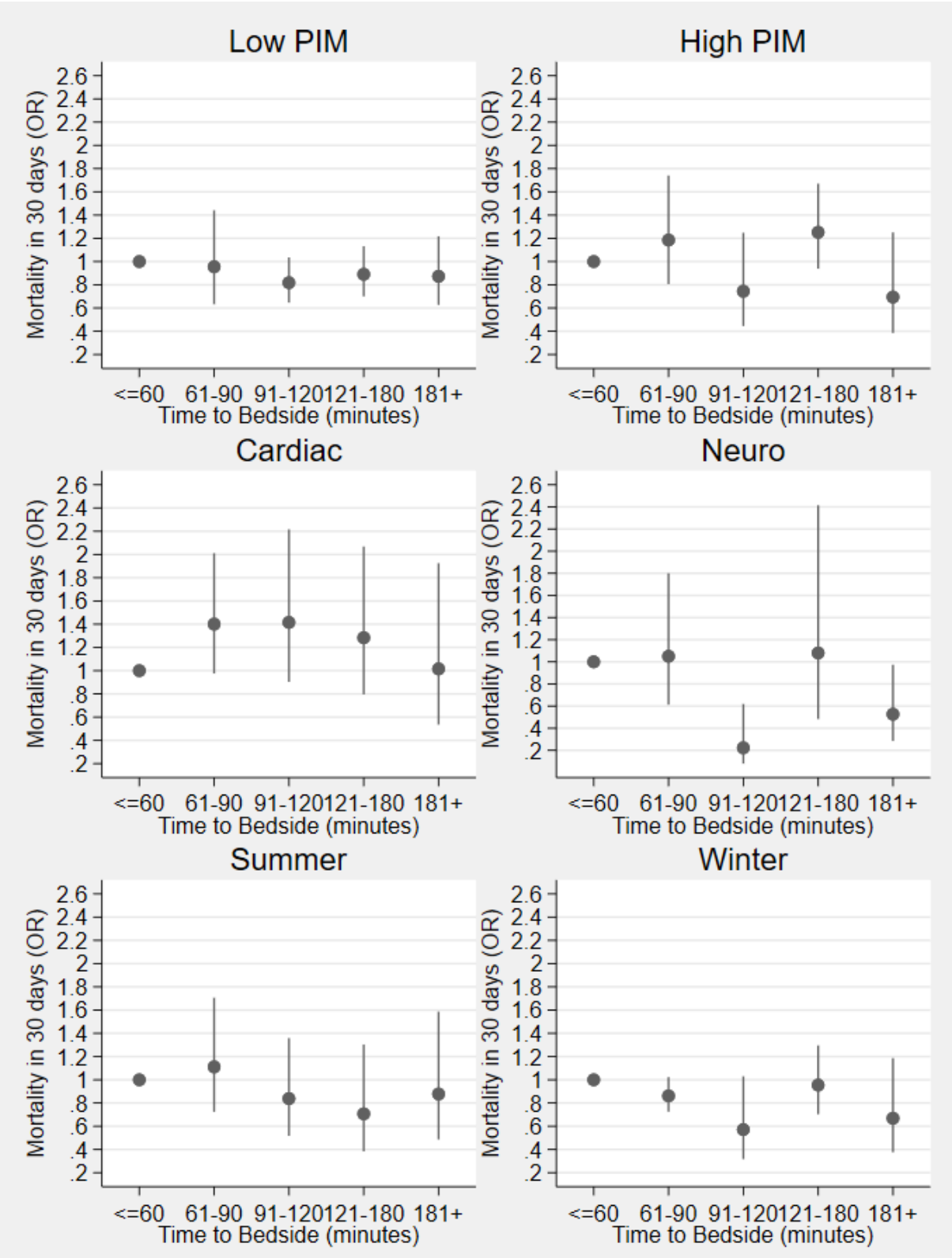
In this supplementary material, results from the subgroup and sensitivity analyses are presented.

The primary analysis investigating the impact of time-to-bedside on mortality 30 days after admission to PICU was repeated for pre-defined subgroups decided *a priori* by the Study Management Group (Supplementary Figure 1). The subgroups were: low PIM score (PIM≤0.10); high PIM score (PIM>0.10); diagnosis of a cardiac condition; diagnosis of a neurological condition; transport undertaken in summer and transport undertaken in winter. In each of these subgroups, the sample size was reduced, but there remained no increasing or decreasing trend between time-to-bedside and odds of mortality. These results were consistent with those seen in the primary analysis (Figure 1).

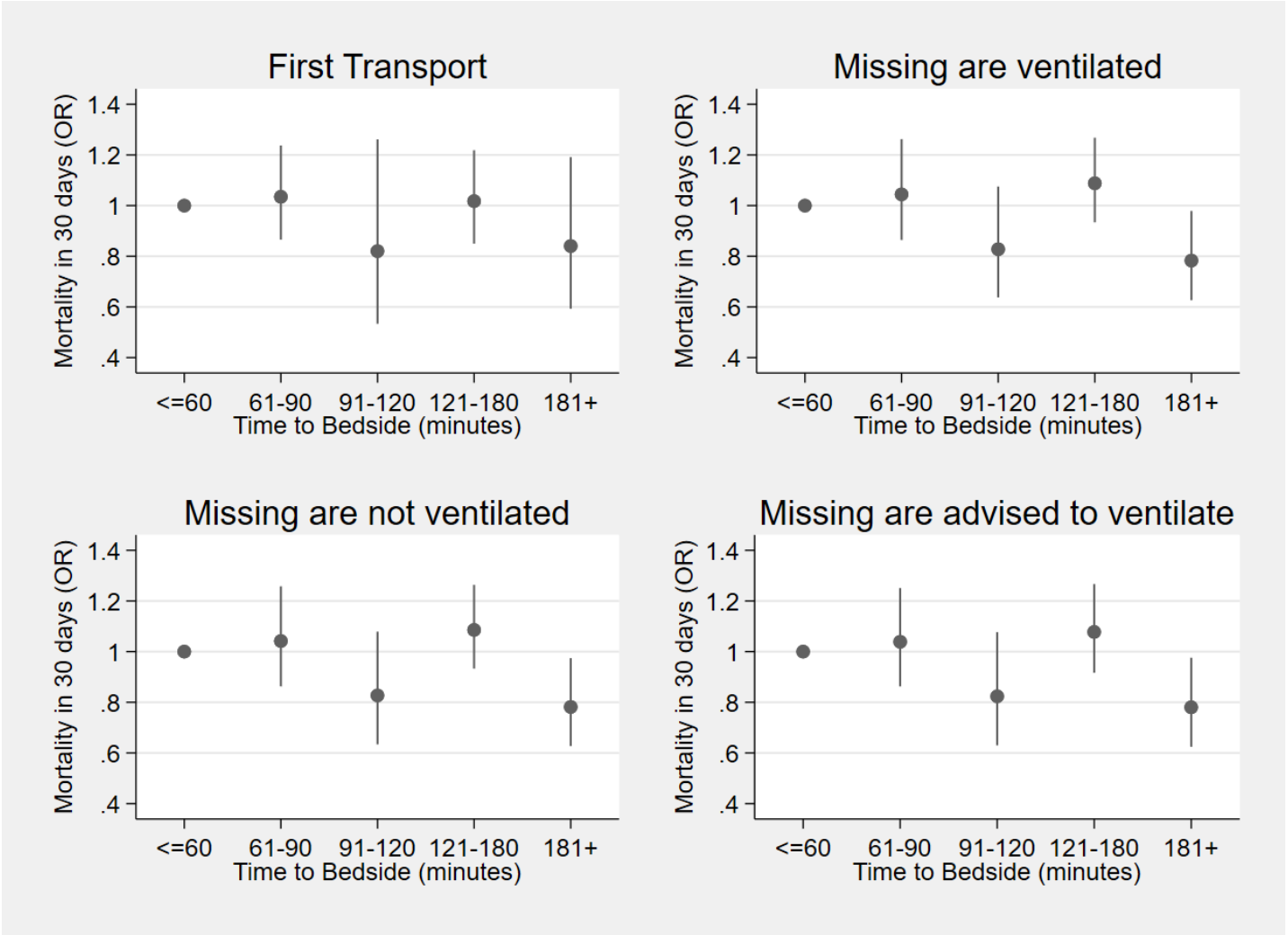
The impact of the assumptions about missing data and data selection were also investigated (Supplementary Figure 2). The results were re-produced using the first transport for child who were transported multiple times in the study time window. Similarly the impact of excluding data for children with missing information about their ventilation status at referral was investigated. In turn, the missing data was assumed to be the situation where the child was ventilated; the child was not ventilated and advice was given to ventilate the child. In all sensitivity analyses, similar results to those found in our primary analyses (Figure 1) were observed.

The consistent pattern of results seen in our subgroup and sensitivity analyses leads us to conclude that the results presented here are robust.

Supplementary Figure 1: Adjusted odds ratios (OR) of 30-day mortality by time-to-bedside for different subgroups. Note: ≤60 minutes is the reference category.



Supplementary Figure 2: Sensitivity analyses to investigate the adjusted odds ratios (OR) of 30-day mortality by time-to-bedside when investigating missing data and data selection assumptions. Note: ≤60 minutes is the reference category.



Ethical approval

DEPICT has ethical approval from the Health Research Authority, the National Research Ethics Service (London Riverside, reference: 17/LO/1267) and the Confidentiality Advisory Group (reference: 17CAG0129).

Conflicts of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Availability of data

All data can be requested directly from PICANet, ICNARC and NHS Digital.

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PICANet is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing, and National Voices. Its aim is to promote quality improvement in patient outcomes, and in particular, to increase the impact that clinical audit, outcome review programmes and registries have on healthcare quality in England and Wales. HQIP holds the contract to commission, manage, and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP), comprising around 40 projects covering care provided to people with a wide range of medical, surgical and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual projects, other devolved administrations and crown dependencies www.hqip.org.uk/national-programmes.