Out of Hours Discharge from Intensive Care and In-Hospital Mortality: A Meta-Analysis

Introduction
Patients who are discharged from Intensive Care Units (ICUs) have long been acknowledged as a group of patients requiring special attention on wards. Mortality rates amongst this group of patients have been reported in the literature as anywhere between 3.7% and 13.3% [1, 2] for the UK and 2.9% to 22.6% [3, 4] worldwide, with a national average of 7.4% [5]). Other groups generally widely considered to be ‘high risk’ have much lower mortality rates, such as upper gastrointestinal surgical patients (2.4%), cardiothoracic surgical patients (2.7%) and patients admitted with acute exacerbation of Chronic Obstructive Pulmonary Disease (COPD) (7.5%) [8]. As early as the 1980s the need to investigate the management of patients following discharge from ICU was acknowledged [9-11], and much work has been done in this area since. Preliminary work in this area has identified as out of hours discharge as a significant risk factor for this excess mortality, however not review to date has collated this evidence.

Objective
This review aims to determine the effect of out of hours intensive care discharge on post-ICU in-hospital mortality (PIIHIM).

Design
The design of this search strategy has been guided by a medical librarian, who will assist in the conduct of these searches.

Data sources
The main databases we plan to search are:

medline
web of knowledge
CINAHL
The Cochrane library
OpenGrey

Limitations
Studies will be limited to those including adults aged 16 and over.
### Search strategy

The search strategy will be adapted according to the database being searched, but will generally include:

1. MORTALITY
2. DEATH
3. (mortality OR death* OR die OR died)
4. 1 OR 2 OR 3
5. INTENSIVE CARE
6. INTENSIVE CARE UNITS
7. CRITICAL CARE
8. "intensive care"
9. "intensive treatment"
10 "intensive therapy"
11."critical care"
12."critical ill"
13. (ITU OR ICU OR AICU)
14. 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13
15. PATIENT DISCHARGE
16. discharge*
17. (post OR after OR following)
18. (ward* OR inhospital OR "in hospital")
19. "transfer* from"
20. 15 OR 16 OR 17 OR 18 OR 19
21. "out of hours"
22. off-hour
23. night-time
24. 21 OR 22 OR 23
25. 4 AND 14 AND 20 AND 24

### Managing references

After conducting the searches, the results will be exported to an independent database. Subsequently, all the references will be merged in a unique database, and duplicates will be automatically identified and removed. Each team member will receive a copy of this final database. We will use reference manager software for this purpose.

### Screening

#### Eligibility

We will include:
- **Study types:**
  - studies which use quantitative methods of data collection and analysis,
- **Article types:**
  - original articles and review articles—including systematic reviews.
- **Participants:**
  - Patients who have been discharged alive from Intensive Care to a lower level of care (HDU or ward). All ages and conditions will be included.
- **Settings:**
Patients discharged from medical, surgical or mixed ICUs will be included.

- Outcome measures:
  - In-hospital mortality.
- Geographical area:
  - Studies conducted in any country.
- Date of publication:
  - Articles published since and including 1990.

We will exclude:
- Measures of mortality which extend beyond hospital discharge, or for which post-ICU mortality cannot be identified from whole hospital stay mortality.

Reviewing results

Results will be reviewed in three stages – at title, at abstract and at full text.

Search results will be screen by title by two researchers, and either rejected as irrelevant or selected for abstract review. Any discrepancies between the two researchers will be discussed and agreed with a third reviewer.

Abstracts will be reviewed by two researchers and either rejected as not relevant or selected for full text review.

Full text articles will be reviewed by two reviewers and either selected for inclusion or excluded on the following grounds:
  - Not relevant
  - Follow-up extends beyond hospital stay
  - Full hospital stay not included
  - In-ICU mortality included
  - Unable to use data

Where eligibility cannot be ascertained, the authors of the study will be contacted to clarify.

Further searches

Once the initial searches have been performed, we will review backward & forward citation for Web of Knowledge for the studies identified as relevant at the end of the screening process (i.e., those that are chosen to be included in the review).

Further searches will be conducted using keywords (using medline) from the initial search papers, and citation searches (using web of knowledge) for each paper. These will again be reviewed initially by title, followed by abstract and full text as above.
Data extraction

Data for each study will be extracted by two researchers using data extraction tables. For studies where there is ambiguity in the data or all data is not reported, clarification will be sought from the authors where possible.

Data for each study will be extracted by two researchers using data extraction tables which will be piloted prior to use. This will include type of study, setting, numbers of patients, definition of out of hours, main findings, population and cohort data, data to allow analysis of risk of bias.

Where there is lack of clarity in the data extracted, clarification will be sought from the authors. Where studies do not report participant level data, this will be sought from the authors.

Quality assessment of studies

Once all searches have been completed, the final included studies will be assessed for quality using the Newcastle Ottowa scale. This scale examines bias in three areas:
Selection
Comparability
Outcome

Studies are given a score out of 9, with a low score indicating areas of concern regarding bias.

A further subjective analysis of quality and bias will be made for each study.

Two reviewers will independently assess each included study, with any discrepancies resolved with a third researcher. Bias assessment of individual papers will be made available in the final publication.

Analysis

Based on our current knowledge of the available data, it is anticipated that meta-analysis will be possible for most studies. Data will be aggregated at the level of individual studies. An assessment of heterogeneity will be made (using both the $X^2$ test and the $I^2$ statistic) and a decision between a fixed effects or random effects model will be made based on this. We will consider an $I^2$ value greater than 50% indicative of substantial heterogeneity.

We will calculate 95% confidence intervals and P values for the outcome of in-hospital mortality.

Sub-analysis

We anticipate there may be some sub-analysis of different definitions of 'out of hours' and of discharge to different clinical settings (ward or HDU care).

If appropriate, sub-analysis of different speciality ICUs may be undertaken, such as ICUs with only cardiac or neurosurgical patients, or with a majority of cardiac and/or neurosurgical patients.

In the case of studies reporting post-ICU mortality in shorter terms than to hospital discharge, these may also be sub-analysed separately.
References


