Survival in cancer patients undergoing in-hospital cardiopulmonary resuscitation: a meta-analysis

CRD summary
The authors concluded that survival to hospital discharge for cancer patients receiving cardiopulmonary resuscitation has improved recently, but remains lower compared with unselected patients. The authors' conclusions appear cautious but limitations with the included studies and the review methodology, for example the limited search strategy and possibility of selection bias, make it difficult to determine their reliability.

Authors' objectives
To determine survival rates to discharge in adult cancer patients receiving in-hospital cardiopulmonary resuscitation (CPR).

Searching
MEDLINE (via PubMed) was searched from 1966 to 2005, and the references of original studies screened. The searches were not restricted by language and search terms were reported.

Study selection
Studies of adult cancer patients, or at least a clearly defined subset of cancer patients, suffering from cardiopulmonary arrest in hospital were eligible for inclusion. The included studies assessed patients with solid tumours (localised or metastatic) or haematological malignancies (including lymphoma/myeloma, leukaemia and haematopoietic stem cell transplantation).

Studies performing in-hospital CPR were eligible for inclusion.

As a minimum, studies were required to report the number of patients experiencing cardiopulmonary arrest and the number of CPR survivors to hospital discharge. The included studies reported overall survival (resuscitation success) to discharge; certain studies also reported immediate arrest survival.

The authors did not explicitly state the inclusion criteria for type of study design, nor did they describe the study designs included in the review.

The primary reviewer screened studies for relevance, and these were then independently screened by the remaining reviewers. Any discrepancies were resolved by re-reviewing the studies.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
Percentage survival rates to hospital discharge were calculated using a weighted estimate, and odds ratios (ORs) for survival over time were calculated for subgroups of patients, with 95% confidence intervals (CIs).

The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Methods of synthesis
Percentages for survival of cancer patients to discharge were tabulated.

Logistic regression was used to investigate differences between subgroups of patients according to type of malignancy (solid tumour or haematological), extent of disease (metastatic or localised), place of cardiac arrest (intensive care unit
or ward) and time of arrest (pre 1990 or 1990 to 2005). Sensitivity analyses were also undertaken by removing studies with small sample sizes.

The authors stated that they conducted tests of homogeneity, but no details were given.

**Results of the review**

Forty-two studies (n=1,707) were included in the review. Studies stratified according to subgroups included patients with solid tumours (n=718) and patients with haematologic malignancy or haematopoietic stem cell transplantation (n=400). Sample sizes were between 3 and 396 patients.

**Overall survival (42 studies).**

One hundred and five patients (6.2%) survived to discharge and sensitivity analyses did not significantly alter the results. A trend for improved survival over time was not indicated using logistic regression.

The authors stated that heterogeneity was evident in several subgroups, but no details were provided.

**Type of malignancy (10 studies).**

There was a significant difference in resuscitation success for malignancy type, with greater success rates in patients with solid tumours than in patients with haematological malignancy: 7.1% versus 2.0% (OR 3.75, 95% CI: 1.76, 7.98, p<0.001). There were no significant differences in survival rates between patients with different types of haematological malignancy.

**Location (10 studies).**

A significant difference in resuscitation success was reported for location, with patients arresting on wards showing greater survival rates (10.1%) than those arresting on intensive care units: 10.1% versus 2.2% (OR 4.97, 95% CI: 2.30, 10.74, p<0.001).

**Extent of disease (15 studies).**

Resuscitation success was significantly higher for patients with localised disease than for patients with metastatic disease: 9.5% versus 5.6% (OR 1.77, 95% CI: 1.00, 3.14, p=0.05). Significant differences in success rates were also reported for time period in patients with metastatic disease, with greater success after 1990 compared with pre-1990: 7.8% versus 0% (OR 1.87, 95% CI: 1.01, 3.46, p=0.05). Adjusting for location, no significant differences in survival were reported for extent of disease.

**Authors’ conclusions**

Overall survival to hospital discharge for cancer patients receiving CPR has increased over time, but such improvements may reflect more selective practice whereby the sickest patients are not selected for CPR. Survival rates in cancer patients also remain lower compared with unselected in-hospital arrests, but the findings still challenge suggestions that CPR is ineffective in patients with metastatic cancer.

**CRD commentary**

The review question was clear and was supported by adequate inclusion criteria for the interventions and outcomes. However, inclusion criteria for the participants were broad, which is likely to have been reflected in the included populations, and there were no inclusion criteria reported for study design. Although not restricted by language, the literature search was limited to one electronic database and no attempt was made to locate unpublished material, thereby increasing the possibility that relevant studies were missed. Details of the methods used to select studies were provided but, as no such details were reported for the data extraction, the potential for reviewer error and bias cannot be ruled out. The authors do not appear to have systematically assessed the validity of the included studies, which limits our interpretation of the findings. However, the authors did highlight a number of important limitations of the included studies, including the potential for selection bias and the lack of clear definitions of cardiopulmonary arrest, which may
have important implications for the meaning of CPR survival. There were also several other limitations, such as methodological differences between the studies, limited reporting of study details, small sample sizes and wide CIs. The authors' conclusions appear cautious but, given the above considerations, it is difficult to determine their reliability.

**Implications of the review for practice and research**
The authors did not state any implications for practice or further research.

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