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Short and long-term mortality in women and men undergoing primary angioplasty: A comprehensive meta-analysis☆,☆☆

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ABSTRACT

Introduction: Women with acute myocardial infarction are treated less aggressively than men and have a higher mortality. It is possible that these sex-related differences in outcome are a result of differences in baseline risk and management.

Methods and results: We undertook a meta-analysis to study the differences in mortality among women and men with ST-segment elevation myocardial infarction (STEMI) undergoing primary percutaneous coronary intervention (P-PCI). Studies reporting sex-specific crude mortality rates and/or adjusted effect estimates in STEMI patients undergoing P-PCI were identified. Among 48 studies, involving 103,895 patients, (26,556 women and 77,337 men), the crude in-hospital [pooled relative risk (RR): 1.94, 95% confidence interval (CI): 1.74–2.16, $p < 0.001$; 23 studies ($n = 43,872$)], 30-day [RR: 1.76, 95% CI: 1.50–2.07, $p < 0.001$; 20 studies ($n = 43,279$)], and long-term [RR: 1.60, 95% CI: 1.46–1.76, $p < 0.001$; 26 studies ($n = 51,656$)] mortality was significantly higher in women compared to men. When meta-analysis using adjusted effect estimates from individual studies was performed, in-hospital [RR: 1.31, 95% CI: 1.08–1.65, $p = 0.007$; 14 studies ($n = 33,380$)] and 30-day mortality [RR: 1.19, 95% CI: 1.01–1.39, $p = 0.03$; 14 studies ($n = 28,564$)] remained significant while long-term mortality [RR: 1.01, 95% CI: 0.93–1.11, $p = 0.75$; 20 studies ($n = 52,492$)] was no longer different between women and men.

Conclusions: Sex-based differences exist in short and long-term mortality among patients with STEMI undergoing P-PCI. However, these differences were markedly attenuated following adjustment for clinical differences and/or hospital course. Despite adjustment, short-term mortality remains higher in women than men, while long-term mortality was no longer significantly different.

1. Introduction

It is well accepted that there are differences in the presentation and outcome of women and men with acute myocardial infarction (AMI). Women with AMI are sicker than men on presentation and have higher short and long-term mortality [1–14]. Although much of the difference in sex-specific outcomes has been attributable to differences in baseline variables and therapies provided, most of the earlier reports examining the cohort of women and men with ST-segment elevation myocardial infarction (STEMI) demonstrated a higher event rate in women even after adjustment for differences in cardiovascular risk profiles and management [1,2,10–15].

Current guidelines recommend percutaneous coronary intervention (PCI) as first line therapy for STEMI [16]. Primary PCI (P-PCI) is widely used throughout the country and there have been numerous practice and quality improvement initiatives aimed at reducing door-to-balloon time in an effort to improve outcomes. Since women with STEMI have higher risk profiles compared to men, the similar relative risk reduction observed with P-PCI would translate into an even larger absolute benefit for women [3,4]. To this effect, many subsequent studies have investigated the impact of gender differences in short and long-term mortality in STEMI patients undergoing P-PCI. Among these studies, there is a great variability in reported results with some but not all reporting similar mortality in women and men. The majority of these studies however are small in size (including fewer than 300 women) and therefore may have been under-powered to examine mortality as a clinical endpoint [3–7,17–39]. Hence, we performed a meta-analysis of all published studies that reported sex-specific data on short and long-term mortality among STEMI patients undergoing P-PCI, aimed at comprehensively and quantitatively reviewing evidence from all available studies.

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☆☆ All the authors take responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.
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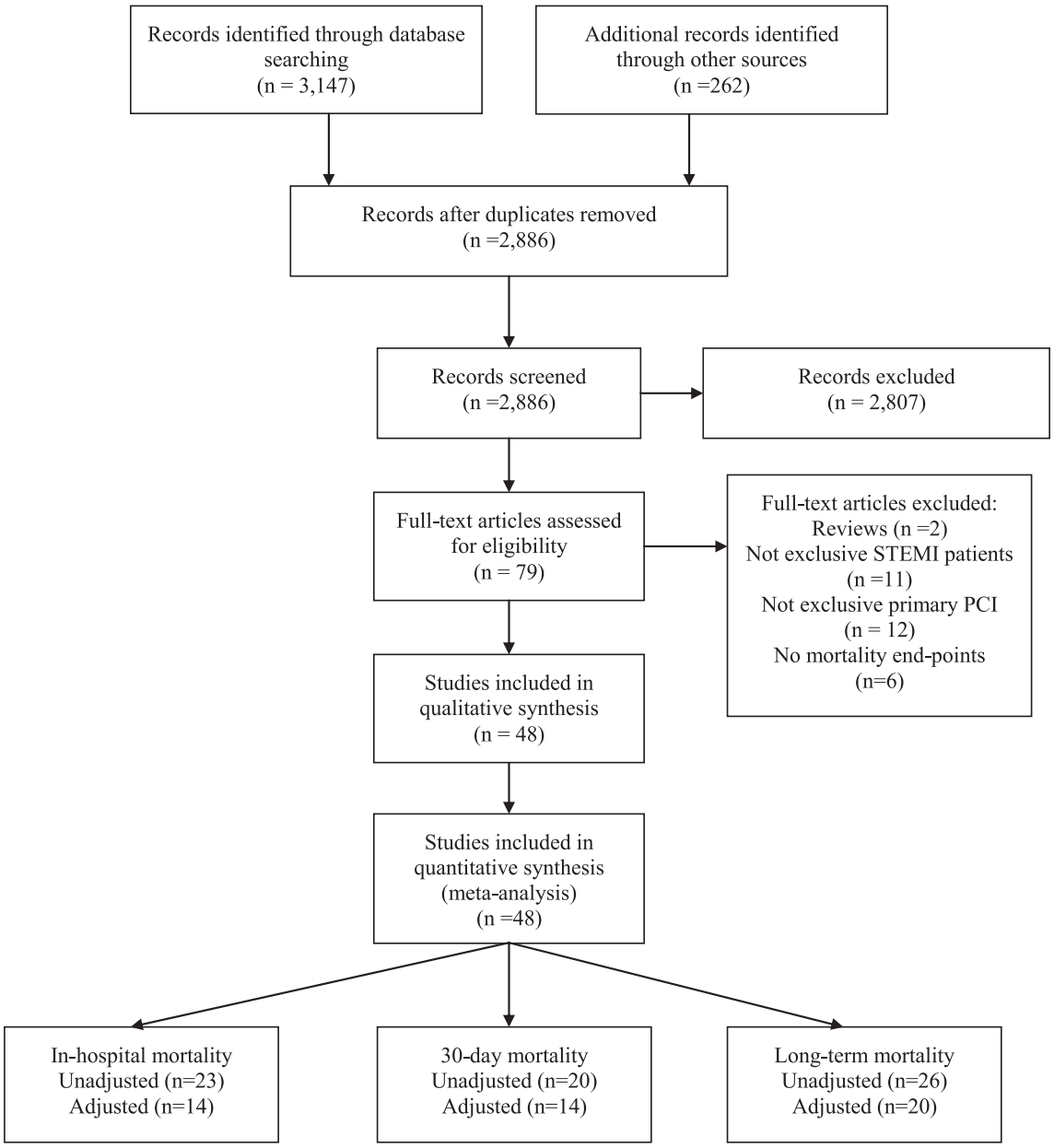

Fig. 1. Flowchart of selection of studies.

2. Methods

2.1. Search strategy

We searched MEDLINE, EMBASE and SCOPUS databases for manuscripts published from inception to November 2014. We used the following key words and medical subject headings: ("ST-elevation myocardial infarction", "STEMI", "myocardial infarction", "percutaneous coronary intervention", "PCI", "primary PCI", "angioplasty", "primary angioplasty") and ("gender", "sex", "female", "male"). A manual search of reference lists of the original retrieved studies and appropriate review articles was also performed to identify studies potentially missed by the database searches. We did not impose any language restrictions for the search.

2.2. Study selection

Two authors (CB and DP) independently identified articles eligible for further review by performing an initial screen of identified abstracts or titles. Articles were included if they (1) examined STEMI patients undergoing P-PCI and (2) reported sex-specific in-hospital, 30-day or long-term mortality rates. Studies that did not report sex-specific mortality data, studies of patients getting PCI following lytic therapy, and studies examining outcomes for all patients referred for PCI but not reporting results explicitly in STEMI patients were excluded from the analysis. Only original articles were considered for this meta-analysis; case reports, case series or conference abstracts without a peer-reviewed manuscript publication were not included. With regard to multiple studies from the same dataset, only one article was included on the basis of relevance, clearly defined end-points and larger sample size.

2.3. Data extraction

Two authors (CB and DP) extracted data independently. Baseline variables, rates of major bleeding and in-hospital, 30-day and long-term (≥6 months) mortality data was recorded. Crude mortality rates and adjusted effect estimates were extracted for these outcomes. For adjusted effect estimates, we extracted reported relative risks or hazard ratios for the occurrence of mortality in women compared to men. For studies that reported more than one adjusted effect estimate, we extracted the effect estimate that was adjusted for most confounders. We also extracted covariates accounted for multivariate adjustment of effect estimates (Supplemental Table S1). The quality of each study was assessed using the MOOSE checklist, and ratified with the Newcastle–Ottawa scale.

2.4. Statistical analysis

The present systematic review and meta-analysis was conducted and reported according to the recommendations of the Meta-analysis Of Observational Studies in