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# Implantable Cardioverter Defibrillators or Cardiac Resynchronization Therapy for In-Hospital Heart Failure: A Rapid Review

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All reports prepared by the Division of Evidence Development and Standards at Health Quality Ontario are impartial. There are no competing interests or conflicts of interest to declare.

## Rapid Review Methodology

Clinical questions are developed by the Division of Evidence Development and Standards at Health Quality Ontario in consultation with experts, end-users, and/or applicants in the topic area. A systematic literature search is then conducted to identify relevant systematic reviews, health technology assessments, and meta-analyses; if none are located, the search is expanded to include randomized controlled trials (RCTs), and guidelines. Systematic reviews are evaluated using a rating scale developed for this purpose. If the systematic review has evaluated the included primary studies using the GRADE Working Group criteria (http://www.gradeworkinggroup.org/index.htm), the results are reported and the rapid review process is complete. If the systematic review has not evaluated the primary studies using GRADE, the primary studies included in the systematic review are retrieved and a maximum of two outcomes are graded. If no well-conducted systematic reviews are available, RCTs and/or guidelines are evaluated. Because rapid reviews are completed in very short timeframes, other publication types are not included. All rapid reviews are developed and finalized in consultation with experts.

## Disclaimer

This rapid review is the work of the Division of Evidence Development and Standards at Health Quality Ontario, and is developed from analysis, interpretation, and comparison of published scientific research. It also incorporates, when available, Ontario data and information provided by experts. As this is a rapid review, it may not reflect all the available scientific research and is not intended as an exhaustive analysis. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its rapid reviews. In addition, it is possible that other relevant scientific findings may have been reported since completion of the review. This report is current to the date of the literature search specified in the Research Methods section, as appropriate. This rapid review may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

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Health Quality Ontario is an arms-length agency of the Ontario government. It is a partner and leader in transforming Ontario's health care system so that it can deliver a better experience of care, better outcomes for Ontarians, and better value for money.

Health Quality Ontario strives to promote health care that is supported by the best available scientific evidence. Health Quality Ontario works with clinical experts, scientific collaborators, and field evaluation partners to develop and publish research that evaluates the effectiveness and cost-effectiveness of health technologies and services in Ontario.

Based on the research conducted by Health Quality Ontario and its partners, the Ontario Health Technology Advisory Committee (OHTAC)—a standing advisory subcommittee of the Health Quality Ontario Board—makes recommendations about the uptake, diffusion, distribution, or removal of health interventions to Ontario's Ministry of Health and Long-Term Care, clinicians, health system leaders, and policy makers.

Rapid reviews, evidence-based analyses and their corresponding OHTAC recommendations, and other associated reports are published on the Health Quality Ontario website. Visit http://www.hqontario.ca for more information.

## About Health Quality Ontario Publications

To conduct its rapid reviews, Health Quality Ontario and/or its research partners reviews the available scientific literature, making every effort to consider all relevant national and international research; collaborates with partners across relevant government branches; consults with clinical and other external experts and developers of new health technologies; and solicits any necessary supplemental information.

In addition, Health Quality Ontario collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario can add an important dimension to the review. Information concerning the health benefits, economic and human resources, and ethical, regulatory, social, and legal issues relating to the intervention may be included to assist in making timely and relevant decisions to optimize patient outcomes.

## Permission Requests



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# Table of Contents

# List of Abbreviations

| | |
|---|---|
| **AMSTAR** | Assessment of Multiple Systematic Reviews |
| **CHF** | Congestive heart failure |
| **CRT** | Cardiac resynchronization therapy |
| **ICD** | Implantable cardioverter defibrillator |

# Background

As legislated in Ontario's *Excellent Care for All Act*, Health Quality Ontario's mandate includes the provision of objective, evidence-informed advice about health care funding mechanisms, incentives, and opportunities to improve quality and efficiency in the health care system. As part of its Quality-Based Funding (QBF) initiative, Health Quality Ontario works with multidisciplinary expert panels (composed of leading clinicians, scientists, and administrators) to develop evidence-based practice recommendations and define episodes of care for selected disease areas or procedures. Health Quality Ontario's recommendations are intended to inform the Ministry of Health and Long-Term Care's Health System Funding Strategy.

For more information on Health Quality Ontario's Quality-Based Funding initiative, visit www.hqontario.ca.

## Objective of Analysis

The objective of this analysis was to determine the effectiveness of implantable cardioverter defibrillator (ICD) and of cardiac resynchronization therapy (CRT) in patients hospitalized for acute congestive heart failure (CHF) compared with those patients not hospitalized for acute CHF who receive either the device or the procedure via pre-planned, elective surgery.

## Clinical Need and Target Population

An ICD monitors heart rhythm and can deliver an electric shock to restore normal rhythm when it detects a potentially fatal arrhythmia. (1) CRT (also known as biventricular pacing) is used for patients with advanced chronic CHF, a wide QRS complex, low left ventricular ejection fraction, and contraction dyssynchrony in a viable myocardium and normal sinus rhythm. (2) ICDs combined with CRT are considered for patients with CHF who are at high risk of sudden death. (2)

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# Rapid Review

## Research Questions

What is the effectiveness of in-hospital insertion of an implantable cardioverter defibrillator (ICD) or of cardiac resynchronization therapy (CRT) in patients hospitalized for acute congestive heart failure (CHF) compared with those patients not hospitalized for acute CHF who receive the device or the procedure via pre-planned, elective surgery.

## Research Methods

### Literature Search

A rapid review literature search was performed on November 2, 2012, using OVID MEDLINE, MEDLINE In-Process and Other Non-Indexed Citations, OVID EMBASE, the Wiley Cochrane Library, and the Centre for Reviews and Dissemination database, for studies published from January 1, 2007, to November 2, 2012. Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search.

### Inclusion Criteria

- English language full-text reports
- published between January 1, 2007, and November 2, 2012
- health technology assessments, systematic reviews, and meta-analyses
- enrolled adult patients who receive an ICD or CRT while in hospital for acute CHF

### Exclusion Criteria

- randomized controlled trials, observational studies, case reports, editorials

### Outcomes of Interest

- mortality
- rehospitalization

### Expert Panel

In August 2012, an Expert Advisory Panel on Congestive Heart Failure Quality-Based Funding was struck. Members of the panel included physicians, personnel from the Ministry of Health and Long-Term Care, and representatives from hospitals.

The role of the Expert Advisory Panel on Congestive Heart Failure Quality-Based Funding was to contextualize the evidence produced by Health Quality Ontario and provide advice on the quality-based funding for CHF within the Ontario health care setting. However, the statements, conclusions, and views expressed in this report do not necessarily represent the views of Expert Advisory Panel members.

# Quality of Evidence

The Assessment of Multiple Systematic Reviews (AMSTAR) measurement tool was used to assess the methodological quality of the systematic reviews. (3)

The quality of the body of evidence for each outcome was examined according to the GRADE Working Group criteria. (4) The overall quality was determined to be very low, low, moderate, or high using a step-wise, structural methodology.

Study design was the first consideration; the starting assumption was that RCTs are high quality, whereas observational studies are low quality. (4) Five additional factors—risk of bias, inconsistency, indirectness, imprecision and publication bias—were then taken into account. Limitations or serious limitations in these areas resulted in downgrading the quality of evidence. Finally, 3 main factors were considered which may raise the quality of evidence: large magnitude of effect, dose response gradient, and accounting for all residual confounding. (4) For more detailed information, please refer to the latest series of GRADE articles. (4)

As stated by the GRADE Working Group, (4) the final quality score can be interpreted using the following definitions:

| | |
|---|---|
| **High** | Very confident that the true effect lies close to the estimate of the effect |
| **Moderate** | Moderately confident in the effect estimate—the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different |
| **Low** | Confidence in the effect estimate is limited—the true effect may be substantially different from the estimate of the effect |
| **Very Low** | Very little confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of effect |

# Results of Literature Search

The database search yielded 296 citations published between January 1, 2007, and November 2, 2012 (with duplicates removed). Articles were excluded based on information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment.

No studies were identified that examined the effectiveness of in-hospital insertion of an ICD or CRT in patients hospitalized for acute CHF compared with those not hospitalized for acute CHF who receive the devices.

During the Congestive Heart Failure Quality-Based Funding expert panel meeting on November 2, 2012, several members raised the point that it is unlikely that any such studies have been conducted, that is, those that so specifically examine the effectiveness of ICD or CRT implantation in patients who have been hospitalized for acute CHF.

# Conclusions

No studies were identified that examined the effectiveness of in-hospital insertion of an implantable cardioverter defibrillator (ICD) or cardiac resynchronization therapy (CRT) in patients hospitalized for acute CHF compared with those patients who receive the devices via pre-planned, elective surgery.

# Acknowledgements

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**Quality-Based Funding Congestive Heart Failure Panel**

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| Dr. Susanna Mak | Cardiologist | University of Toronto: Department of Medicine, Division of Cardiology, Mount Sinai Hospital |
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| | Scientific Director/VP Research, University of Ottawa Heart Institute / Professor of Medicine, | |
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| Nancy Hunter | LHIN Liaison & Business Development | Cardiac Care Network of Ontario |
| **Ministry Representatives** | | |
| Gary Coleridge | Senior Program Consultant | Ministry of Health and Long-Term Care |
| Louie Luo | Senior Methodologist | Ministry of Health and Long-Term Care |

# Appendices

## Appendix 1: Literature Search Strategies

**Search date:** November 2, 2012
**Databases searched:** OVID MEDLINE, MEDLINE In-Process and Other Non-Indexed Citations, EMBASE; Cochrane Library; CRD
**Limits:** 2007-current; English
**Filters**: health technology assessments, systematic reviews, and meta-analyses

Database: Ovid MEDLINE(R) <1946 to October Week 4 2012>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <November 01, 2012>, Embase <1980 to 2012 Week 43>
Search Strategy:

| # | Searches | Results |
|---|---|---|
| 1 | exp Heart Failure/ | 328766 |
| 2 | (((cardia? or heart) adj (decompensation or failure or incompetence or insufficiency)) or cardiac stand still or ((coronary or myocardial) adj (failure or insufficiency))).ti,ab. | 259379 |
| 3 | or/1-2 | 418859 |
| 4 | ((implantable adj cardioverter defibrillator*) or (implantable adj defibrillator*)).mp. | 17319 |
| 5 | ((cardiac resynchronization adj2 therap*) or cardiac resynchronization pacing therap* or (pacing adj atrio biventricular) or (pacing adj biventricular) or cardiac resynchronization*).mp. | 12561 |
| 6 | ((biventricular adj2 pacemaker*) or pacemaker* or (artificial adj pacemaker*) or (artificial cardiac adj pacemaker*) or (artificial adj cardiac adj pacing*)).mp. | 85118 |
| 7 | exp defibrillator/ or exp cardiac resynchronization therapy/ or exp heart pacing/ or exp pacemaker/ or cardiac resynchronization therapy device/ or exp artificial heart pacemaker/ use emez | 82251 |
| 8 | Defibrillators, Implantable/ or Cardiac Resynchronization Therapy/ or Cardiac Resynchronization Therapy Devices/ or Pacemaker, Artificial/ or Cardiac Pacing, Artificial/ use mesz | 94282 |
| 9 | or/4-8 | 142045 |
| 10 | 3 and 9 | 27437 |
| 11 | Meta Analysis.pt. | 37256 |
| 12 | Meta Analysis/ use emez | 66797 |
| 13 | Systematic Review/ use emez | 54209 |
| 14 | exp Technology Assessment, Biomedical/ use mesz | 8883 |
| 15 | Biomedical Technology Assessment/ use emez | 11403 |
| 16 | (meta analy* or metaanaly* or pooled analysis or (systematic* adj2 review*) or published studies or published literature or medline or embase or data synthesis or data extraction or cochrane).ti,ab. | 294888 |
| 17 | ((health technolog* or biomedical technolog*) adj2 assess*).ti,ab. | 3796 |
| 18 | or/11-17 | 354909 |
| 19 | 10 and 18 | 681 |
| 20 | limit 19 to english language | 638 |
| 21 | limit 20 to (case reports or comment or editorial or letter or conference abstract) [Limit not valid in Ovid MEDLINE(R),Ovid MEDLINE(R) In-Process,Embase; records were retained] | 72 |
| 22 | 20 not 21 | 566 |
| 23 | limit 22 to yr="2007 -Current" | 296 |

**Cochrane Library**

| ID | Search | Hits |
|---|---|---|
| #1 | MeSH descriptor: [Heart Failure] explode all trees | 4873 |
| #2 | ((cardia? or heart) next (decompensation or failure or incompetence or insufficiency)) or cardiac stand still or ((coronary or myocardial) next (failure or insufficiency)):ti,ab,kw (Word variations have been searched) | 9337 |
| #3 | #1 or #2 | 9342 |
| #4 | MeSH descriptor: [Defibrillators, Implantable] this term only | 741 |
| #5 | MeSH descriptor: [Cardiac Resynchronization Therapy] this term only | 62 |
| #6 | MeSH descriptor: [Cardiac Resynchronization Therapy Devices] this term only | 8 |
| #7 | MeSH descriptor: [Pacemaker, Artificial] explode all trees | 567 |
| #8 | MeSH descriptor: [Cardiac Pacing, Artificial] this term only | 959 |
| #9 | ((implantable near cardioverter defibrillator*) or (implantable near defibrillator*)):ti,ab,kw | 870 |
| #10 | ((cardiac resynchronization near/2 therap*) or cardiac resynchronization pacing therap* or (pacing near atrio biventricular) or (pacing near biventricular) or cardiac resynchronization*):ti,ab,kw | 370 |
| #11 | ((biventricular near/2 pacemaker*) or pacemaker* or (artificial near pacemaker*) or (artificial cardiac near pacemaker*) or (artificial near cardiac near pacing*)):ti,ab,kw | 1568 |
| #12 | #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 | 2286 |
| #13 | #3 and #12 from 2007 to 2012 | 297 |
| #14 | #13 in Trials | 249 |
| #15 | #13 not #14 | 48 |

**CRD**

| Line | Search | Hits |
|---|---|---|
| 1 | MeSH DESCRIPTOR heart failure EXPLODE ALL TREES | 510 |
| 2 | (((cardia? OR heart) ADJ (decompensation OR failure OR incompetence OR insufficiency)) OR cardiac stand still OR ((coronary OR myocardial) ADJ (failure OR insufficiency))):TI | 317 |
| 3 | #1 OR #2 | 552 |
| 4 | MeSH DESCRIPTOR Defibrillators, Implantable | 150 |
| 5 | MeSH DESCRIPTOR Cardiac Resynchronization Therapy | 16 |
| 6 | MeSH DESCRIPTOR Cardiac Resynchronization Therapy Devices | 0 |
| 7 | MeSH DESCRIPTOR Pacemaker, Artificial | 76 |
| 8 | MeSH DESCRIPTOR Cardiac Pacing, Artificial | 78 |
| 9 | ((implantable ADJ cardioverter defibrillator*) OR (implantable ADJ defibrillator*)):TI | 81 |
| 10 | ((((cardiac resynchronization ADJ2 therap*) OR cardiac resynchronization pacing therap* OR (pacing ADJ atrio biventricular) OR (pacing ADJ biventricular) OR cardiac resynchronization*))):TI | 46 |
| 11 | (((biventricular ADJ2 pacemaker*) OR pacemaker* OR (artificial ADJ pacemaker*) OR (artificial cardiac ADJ pacemaker*) OR (artificial ADJ cardiac ADJ pacing*))):TI | 42 |
| 12 | #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 | 259 |
| 13 | #3 AND #12 | 74 |
| 14 | * FROM 2007 TO 2012 | 27458 |
| 15 | #13 AND #14 | 44 |

# References

(1) Medical Advisory Secretariat. Implantable cardioverter defibrillators. Prophylactic use: an evidence-based analysis. Ont Health Technol Assess Ser [Internet]. 2005 November [cited 2012 Dec 4];5(14):1-74. Available from: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/ohtas-reports-and-ohtac-recommendations/implantable-cardioverter-defibrillators

(2) Medical Advisory Secretariat. Biventricular pacing (cardiac resynchronization therapy): an evidence-based analysis. Ont Health Technol Assess Ser [Internet]. 2005 September [cited 2012 Dec 4];5(13):1-60. Available from: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/ohtas-reports-and-ohtac-recommendations/biventricular-pacemakers

(3) Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med Res Methodol. 2007;7(10).

(4) Guyatt GH, Oxman AD, Schunemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011;64(4):380-2.

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