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Sodium Restriction in Heart Failure: A Rapid Review

Health Quality Ontario

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Evidence Development and Standards Branch at Health Quality Ontario

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Conflict of Interest Statement

All authors in the Evidence Development and Standards branch at Health Quality Ontario are impartial. There are no competing interests or conflicts of interest to declare.

Rapid Review Methodology

Rapid reviews are completed in 2–4-week time frames. Clinical questions are developed by the Evidence Development and Standards branch 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. The methods prioritize systematic reviews, which, if found, are rated by AMSTAR to determine the methodological quality of the review. 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 in the systematic review are retrieved and the GRADE criteria are applied to 2 outcomes. If no systematic review is found, then RCTs or observational studies are included, and their risk of bias is assessed. All rapid reviews are developed and finalized in consultation with experts.

About Health Quality Ontario

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. The Evidence Development and Standards branch works with expert advisory panels, clinical experts, scientific collaborators, and field evaluation partners to conduct evidence-based reviews that evaluate the effectiveness and cost-effectiveness of health interventions in Ontario.

Based on the evidence provided by Evidence Development and Standards and its partners, the Ontario Health Technology Advisory Committee—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.

Health Quality Ontario's research is published as part of the *Ontario Health Technology Assessment Series,* which is indexed in MEDLINE/PubMed, Excerpta Medica/Embase, and the Centre for Reviews and Dissemination database. Corresponding Ontario Health Technology Advisory Committee recommendations and other associated reports are also 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, the Evidence Development and Standards and its research partners review the available scientific literature, making every effort to consider all relevant national and international research; collaborate with partners across relevant government branches; consult with expert advisory panels, clinical and other external experts, and developers of health technologies; and solicit any necessary supplemental information.

In addition, Evidence Development and Standards 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 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.

Disclaimer

This rapid review is the work of the Evidence Development and Standards branch 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 as of the date of the literature search specified in the Research Methods section. Health Quality Ontario makes no representation that the literature search captured every publication that was or could be applicable to the subject matter of the report. 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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List of Abbreviations

NYHA	New York Heart Association
RCT	Randomized controlled trial

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 Procedures (QBP) 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 Procedures initiative, visit www.hqontario.ca.

Objective of Analysis

The objective of this rapid review was to examine the effects of restricting sodium in patients with heart failure. The outcomes of interest were health resource utilization and mortality.

Clinical Need and Target Population

High consumption of sodium has been associated with an increased risk of many diseases, including hypertension, left ventricular hypertrophy, and cardiovascular disease. (1) Although many public health campaigns have attempted to persuade the general population to reduce the amount of sodium they consume, average daily consumption remains high. (2)

Technology/Technique

Several guidelines have recommended that sodium be restricted in patients with heart failure, (1,3,4) but the evidence on which these recommendations are based is limited. A randomized trial at the University of Alberta called SODIUM-HF is currently comparing a low-sodium diet to a normal-sodium diet in ambulatory patients with heart failure, (5) but results have yet to be published.

Rapid Review

Research Question

What are the effects of restricting sodium in patients with heart failure?

Research Methods

Literature Search

Search Strategy

A literature search was performed on April 1, 2014, using Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, Ovid Embase, EBSCO Cumulative Index to Nursing & Allied Health Literature (CINAHL), and EBM Reviews, for studies published from January 1, 2003, to April 1, 2014. (Appendix 1 provides details of the search strategies.) 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 publications
- published between January 1, 2003, and April 1, 2014
- randomized controlled trials (RCTs), systematic reviews, meta-analyses, and prospective observational studies with historical or contemporaneous controls
- patients presumed to be returning to the community if hospitalized (i.e., not to palliative care or long-term care)
- ≥ 20 patients
- ≥ 30 days' follow-up
- reported at least 1 outcome of interest

Exclusion Criteria

- case series (studies with no comparison group)

Outcomes of Interest

- health resource utilization (emergency department visits, hospitalizations)
- mortality (all-cause or cardiac-related)

Expert Panel

In December 2013, an Expert Advisory Panel on Post-Acute, Community-Based Care for CHF Patients was struck. Members of the community-based panels included family physicians, physician specialists, community health care administrators, and allied health professionals.

The role of the expert advisory panel was to provide advice on primary CHF patient groupings; to review the evidence, guidance, and publications related to defined CHF patient populations; to identify and prioritize interventions and areas of community-based care; and to advise on the development of a care pathway model. The role of panel members was to provide advice on the scope of the project, the methods used, and the findings. However, the statements, conclusions, and views expressed in this report do not necessarily represent the views of the expert panel members.

Quality of Evidence

The methodology for a rapid review of primary studies assesses the quality of the evidence using a risk of bias assessment of the individual studies, including allocation concealment, blinding, accounting of patients and outcome events, selective reporting bias, and other limitations. (6) A full quality of evidence assessment is not typically performed due to time limitations.

Results of Rapid Review

The database search yielded 954 citations published between January 1, 2003, and April 1, 2014, (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.

Eight studies (5 RCTs and 3 observational studies) met the inclusion criteria. The reference lists of the included studies were hand-searched to identify other relevant studies, but no additional citations were included.

For each included study, the study design was identified and is summarized below in Table 1, a modified version of a hierarchy of study design by Goodman, 1996. (7)

Table 1: Body of Evidence Examined According to Study Design

Study Design	Number of Eligible Studies
RCTs	
Systematic review of RCTs	
Large RCT	5
Small RCT	
Observational Studies	
Systematic review of non-RCTs with contemporaneous controls	
Non-RCT with non-contemporaneous controls	3
Systematic review of non-RCTs with historical controls	
Non-RCT with historical controls	
Database, registry, or cross-sectional study	
Case series	
Retrospective review, modelling	
Studies presented at an international conference	
Expert opinion	
Total	**8**

Abbreviation: RCT, randomized controlled trial.

DiNicolantonio et al published a systematic review in 2012 that compared low- to normal-sodium diets in patients with heart failure, (8) but it was retracted last year due to a possible duplication of data in 2 of the included studies (the duplication could not be verified because according to the authors, there was a computer failure and all data were lost). All 6 RCTs in the systematic review were by the same group of authors, but 2 of the 6 were excluded from this rapid review because they selected severely ill heart failure patients (refractory New York Heart Association [NYHA] IV heart failure) and may not be generalizable to a population with NYHA I–III heart failure. The remaining 4 RCTs were included in this rapid review, (9-12) as well as 1 other RCT by Aliti et al (13) and 3 observational studies. (14-16) The characteristics of the included studies are listed in Table 2.

Table 2: Study Characteristics—Sodium Restriction in Heart Failure

Author, Year	Recruitment Period (Location)	N	Age, y	NYHA Class	Ejection Fraction	Treatment	Control	Primary Outcomes (Secondary Outcomes)	Follow-up
Paterna et al, 2008[ab] (RCT) (12)	January 2000 to May 2005 (Palermo, Italy)	232	55–83	II at 30 days post-discharge	< 35%	Oral furosemide + 120 mmol Na/day	Oral furosemide + 80 mmol Na/day	Readmissions (mortality, BNP)	From 30 days post-discharge to 180 days
Parrinello et al, 2009[ab] (RCT) (9)	September 2005 to August 2007	173	72.5 (SD 7)	II at 30 days post-discharge	< 35%	Oral furosemide + 120 mmol Na/day	Oral furosemide + 80 mmol Na/day	Readmissions (mortality)	From 30 days post-discharge to 12 months
Paterna et al, 2009[a] (RCT) (11)	June 2005 to September 2007 (Palermo, Italy)	410 (8 groups)	53–86	II at 30 days post-discharge	< 35%	Oral furosemide + 120 mmol Na/day	Oral furosemide + 80 mmol Na/day	Readmissions (mortality, BNP, aldosterone, PRA)	Study period 30–180 days post-discharge
Arcand et al, 2011 (Obs) (14)	2003 to 2007 (Toronto, Canada)	123	60 (SD 13)	I–IV	< 35%	3-day food record; patients divided into 3 tertiles		Acute decompensated heart failure (all-cause hospitalization, death)	3 years
Lennie et al, 2011 (Obs) (15)	Unclear (Kentucky/ Georgia/ Indiana/Ohio, USA)	302	62 (SD 12)	I–IV (results stratified by I/II and III/IV)	< 40%, or preserved LVEF ≥ 40%	In-hospital 24-hour urinary Na ≥ 3 g (Group 1)	In-hospital 24-hour urinary Na < 3 g (Group 2)	Composite endpoint: first cardiac-related ED visit, cardiac-related hospitalization, cardiac-related death, all-cause death	12 months
Paterna et al, 2011[a] (RCT) (10)	September 2000 to August 2007 (Palermo and Naples, Italy)	1,771	74.7 (SD 11, range 57–84)	III	< 40%	IV furosemide + hypertonic saline solution 2 x/day + 120 mmol Na/day	IV furosemide + 80 mmol Na/day	Mortality and readmission for heart failure (cardiac-related death, change in NYHA)	Mean 57 months (SD 15 months, range 31–83 months)
Son et al, 2011 (Obs) (16)	Unclear (Seoul, South Korea)	232	65 (SD 10)	II–IV	< 40%	In-hospital 24-hour urinary Na ≥ 3 g (Group 1)	In-hospital 24-hour urinary Na < 3 g (Group 2)	Composite endpoint: first cardiac-related ED visit, cardiac-related hospitalization, cardiac-related death (symptom burden: breathlessness, swelling of legs, lethargy, etc.)	12 months
Aliti et al, 2013 (RCT) (12)	July 2009 to April 2012 (Brazil)	75	60 (SD 11)	III–IV	< 45%	800 mg Na/day + ≤ 800 mL fluid/day	3–5 g Na/day + ≥ 2.5 L fluid/day	Weight loss and clinical stability at 3 days (perceived thirst, readmissions within 30 days)	30 days

Abbreviations: BNP, brain natriuretic peptide; ED, emergency department; IV, intravenous; LVEF, left ventricular ejection fraction; Na, sodium; NYHA, New York Heart Association; Obs, observational study; PRA, plasma renin activity; RCT, randomized controlled trial; SD, standard deviation.

[a]Study included in the DiNicolantonio et al systematic review. (8)

[b]A notice of concern was issued by the *Journal of Cardiac Failure* because of the possibility of patient duplication in the Parrinello et al (9) and Paterna et al 2008 (12) studies.

The 4 RCTs from the DiNicolantonio et al systematic review (9-12) had several limitations related to the rigour of reporting:

- As mentioned previously, there was speculation about duplication of data between 2 RCTs, but this concern could not be verified due to a computer malfunction. (9,12)
- The results of the 4 RCTs were controversial; they indicated that patient outcomes were better in patients with a normal sodium intake than in those with a low sodium intake, and this finding was inconsistent with international guidelines (1-3) and observational studies in this area. (14-16) While challenging previous knowledge is acceptable and exciting, the challenge must be reinforced with high-quality study design and outcome reporting.
- The 4 RCTs reported very high compliance rates in both treatment groups (normal sodium intake and low sodium intake) based on reviews of patient diaries, but all 4 RCTs included a similar phrase: "patients showed a good compliance with assigned diet and fluid intake." Studies of sodium restriction usually report between 43% and 88% compliance in patients with heart failure. (17)
- With the exception of patients who died during the follow-up period, 3 of the 4 RCTs reported that no patients were lost to follow-up after randomization. (9,11,12) The study reported that 8% were lost to follow-up, (10) but that these patients were excluded from the final analysis (i.e., no intent-to-treat analysis was performed).

Due to this list of potential flaws in 4 of the 5 RCTs, they were not subjected to meta-analysis; separate outcomes are reported in Table 3.

Table 3: Results of RCTs Comparing Low Sodium to Normal Sodium in Patients With Heart Failure

Author, Year	N	Heart Failure Readmissions		Mortality	
		Low Sodium	Normal Sodium	Low Sodium	Normal Sodium
Paterna et al, 2008[ab] (12)	232	30/114	9/118	15/114	6/118
Parrinello et al, 2009[ab] (9)	173	44/86	12/87	20/86	4/87
Paterna et al, 2009[a] (11)	370 (8 treatment groups)	130/179	75/191	26/179	14/191
Paterna et al, 2011[a] (10)	1,771	305/890	163/881	212/890	114/881
Aliti et al, 2013 (13)	71	11/37	7/34	NR	NR

Abbreviations: NR, not reported; RCT, randomized controlled trial.
[a]Study included in the DiNicolantonio et al systematic review. (8)
[b]A notice of concern was issued by the *Journal of Cardiac Failure* because of the possibility of patient duplication in Parrinello et al (9) and Paterna et al 2008 (12) studies.

The observational study by Son et al (16) found that, after 12 months, patients whose in-hospital 24 hour urinary sodium excretion was < 3 g had fewer heart failure–related symptoms and better health outcomes than patients whose sodium excretion was > 3 g. Similarly, the observational study by Lennie et al (15) found that patients with NYHA class III and IV heart failure had better outcomes when sodium was restricted to < 3 g/day. The observational study by Arcand et al (14) found that heart failure patients with a diet high in sodium (based on a 3-day nutrition diary) had poorer outcomes than patients with a diet lower in sodium.

Conclusions

There is conflicting evidence about the effects of restricting sodium in patients with heart failure. More high-quality research is needed in this area.

Acknowledgements

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Appendices

Appendix 1: Literature Search Strategies

Search date: April 1, 2014
Databases searched: OVID MEDLINE, MEDLINE In-Process and Other Non-Indexed Citations, All EBM Databases (see below), CINAHL

Databases: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to February 2014>, EBM Reviews - ACP Journal Club <1991 to March 2014>, EBM Reviews - Database of Abstracts of Reviews of Effects <1st Quarter 2014>, EBM Reviews - Cochrane Central Register of Controlled Trials <January 2014>, EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>, EBM Reviews - Health Technology Assessment <1st Quarter 2014>, EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2014>, Ovid MEDLINE(R) <1946 to March Week 3 2014>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <March 31, 2014>
Search Strategy:

#	Searches	Results
1	exp Patient Discharge/	19415
2	exp Aftercare/ or exp Convalescence/	10105
3	"Continuity of Patient Care"/ or exp "Recovery of Function"/	47006
4	((patient* adj2 discharge*) or after?care or post medical discharge* or post?discharge* or convalescen*).ti,ab.	37224
5	exp Stroke/	86862
6	exp brain ischemia/ or exp intracranial hemorrhages/	130437
7	(stroke or poststroke or tia or transient ischemic attack or ((cerebral vascular or cerebrovascular) adj (accident* or infarct*)) or CVA or cerebrovascular apoplexy or brain infarct* or (brain adj2 isch?emia) or (cerebral adj2 isch?emia) or (intracranial adj2 h?emorrhag*) or (brain adj2 h?emorrhag*)).ti,ab.	198358
8	exp Heart Failure/	90261
9	(((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.	131739
10	exp Pulmonary Disease, Chronic Obstructive/	37119
11	exp Emphysema/	10774
12	(copd or coad or chronic airflow obstruction* or (chronic adj2 bronchitis) or emphysema).ti,ab.	57116
13	(chronic obstructive adj2 (lung* or pulmonary or airway* or airflow* or respiratory or bronchopulmonary) adj (disease* or disorder*)).ti,ab.	35373
14	exp Pneumonia/	74999
15	(pneumoni* or peripneumoni* or pleuropneumoni* or lobitis or ((pulmon* or lung*) adj inflammation*)).ti,ab.	138936
16	or/1-15	762112
17	Diet, Sodium-Restricted/	5887
18	exp Sodium, Dietary/	8604
19	exp Sodium Chloride, Dietary/	4247
20	(low sodium or salt free or low salt or sodium chloride or table salt or ((salt or sodium or NaCL) adj2 diet*) or (sodium adj2 restrict*)).ti,ab.	29922
21	or/17-20	37123
22	16 and 21	1838
23	limit 22 to (english language and yr="2003 -Current") [Limit not valid in CDSR,ACP Journal Club,DARE,CCTR,CLCMR; records were retained]	824
24	remove duplicates from 23	730

CINAHL

#	Query	Results
S1	(MH "Patient Discharge+") or (MH "After Care") or (MH "Recovery") or (MH "Continuity of Patient Care+")	45,983
S2	((patient* N2 discharge*) or aftercare or after care or post medical discharge* or postdischarge* or post discharge* or convalescen*)	29,736
S3	(MH "Stroke+") or (MH "Cerebral Ischemia+") or (MH "Intracranial Hemorrhage+") or (MH "Stroke Patients")	50,226
S4	(stroke or poststroke or tia or transient ischemic attack or ((cerebral vascular or cerebrovascular) N1 (accident* or infarct*)) or CVA or cerebrovascular apoplexy or brain infarct* or ((brain or cerebral) N2 (ischemia or ischaemia)) or ((intracranial or brain) N2 (hemorrhag* or haemorrhag*)))	62,512
S5	(MH "Heart Failure+")	22,829
S6	((cardia* or heart) N1 (decompensation or failure or incompetence or insufficiency)) or cardiac stand still or ((coronary or myocardial) N1 (failure or insufficiency))	29,505
S7	(MH "Pulmonary Disease, Chronic Obstructive+") or (MH "Emphysema+")	11,763
S8	((chronic obstructive N2 (lung* or pulmonary or airway* or airflow* or respiratory or bronchopulmonary) N1 (disease* or disorder*)) or (copd or coad or chronic airflow obstruction* or (chronic N2 bronchitis) or emphysema))	15,056

S9	(MH "Pneumonia+")	12,640
S10	(pneumoni* or peripneumoni* or pleuropneumoni* or lobitis or ((pulmon* or lung*) N1 inflammation*))	19,831
S11	S1 OR S2 or S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10	177,673
S12	(MH "Diet, Sodium-Restricted")	856
S13	(MH "Sodium, Dietary+")	2,303
S14	(MH "Sodium Chloride, Dietary")	1,824
S15	low sodium or salt free or low salt or sodium chloride or table salt or ((salt or sodium) N2 diet*) or (sodium N2 restrict*) or NaCL diet*	5,977
S16	S12 OR S13 OR S14 OR S15	5,977
S17	S11 AND S16	537
S18	S11 AND S16 Limiters - Published Date: 20030101-20141231; English Language	434

Appendix 2: Evidence Quality Assessment

Table A1: Risk of Bias Among Randomized Controlled Trials for the Comparison of Low Sodium Versus Normal Sodium in Patients With Heart Failure[a]

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Paterna et al, 2008 (12)	No limitations	Limitations[b]	Limitations[c]	Limitations[d]	Limitations[e]
Parrinello et al, 2009 (9)	No limitations	Limitations[b]	Limitations[c]	Limitations[d]	Limitations[e]
Paterna et al, 2009 (11)	No limitations	Limitations[b]	Limitations[c]	Limitations[d]	No limitations
Paterna et al, 2011 (10)	No limitations	Limitations[b]	Limitations[f]	Limitations[d]	No limitations
Aliti et al, 2013 (13)	No limitations	Limitations[b]	No limitations	No limitations	No limitations

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation.

[a]The GRADE assessment was not completed, because these studies were not combined in a meta-analysis due to flaws in the studies themselves.

[b]Single-blinding of physicians performing evaluations; patients were not blinded.

[c]No statement to indicate whether any patients were lost to follow-up.

[d]Indicated high compliance with sodium and fluid restrictions, but it is unclear how authors maintained this compliance when several studies indicate compliance is challenging for patients with heart failure. (17)

[e]Risk of study sample duplication.

[f]Patients lost to follow-up were excluded from the analysis.

Table A2: Risk of Bias Among Observational Trials for the Comparison of Low Sodium Versus Normal Sodium in Patients With Heart Failure

Author, Year	Appropriate Eligibility Criteria	Appropriate Measurement of Exposure	Appropriate Measurement of Outcome	Adequate Control for Confounding	Complete Follow-Up
Arcand et al, 2011 (14)	No limitations	No limitations	No limitations	Limitations[a]	No limitations
Lennie et al, 2011 (15)	No limitations	No limitations	Limitations[b]	Limitations[a]	No limitations
Son et al, 2011 (16)	No limitations	No limitations	No limitations	Limitations[a]	No limitations

Abbreviations: NYHA, New York Heart Association.

[a]Unclear what bias was associated with how sodium level was determined at baseline: was a 1-time measurement sufficient?

[b]The outcome was reported mostly by NYHA class rather than by sodium status.

References

(1) Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE, Drazner MH, et al. 2013 ACCF/AHA guideline for the management of heart failure. A report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines. J Am Coll Cardiol. 2013;62(16):147-239.

(2) Institute of Medicine. Sodium intake in populations: assessment of evidence [Internet]. Washington (DC): National Academy of Sciences, 2013 [cited 2014 Apr 14]. 4 p. Available from: http://www.iom.edu/~/media/Files/Report%20Files/2013/Sodium-Intake-Populations/SodiumIntakeinPopulations_RB.pdf.

(3) Scottish Intercollegiate Guidelines Network. Management of chronic heart failure. Edinburgh, Scotland: Scottish Intercollegiate Guidelines Network, 2007. 59 p.

(4) Arnold JMO, Liu P, Demers C, Dorian P, Giannetti N, Haddad H, et al. Canadian Cardiovascular Society consensus conference recommendations on heart failure 2006: diagnosis and management. Can J Cardiol. 2006;22(1):23-45.

(5) University of Alberta. SODIUM-HF: study of dietary intervention under 100 mmol in heart failure [Internet]. In: ClinicalTrials.gov [Internet]. Bethesda (MD): National Library of Medicine (US); 2013 [cited 30 Jul 2014]. Available from: http://www.clinicaltrials.gov/ct2/show/NCT02012179?term=sodium+hf&rank=1) NLM Identifier NCT02012179.

(6) Guyatt GH, Oxman AD, Vist G, Kunz R, Brozek J, Alonso-Coello P, et al. Rating the quality of the evidence--study limitations (risk of bias). J Clin Epidemiol. 2011;64(4):407-15.

(7) Goodman C. Literature searching and evidence interpretation for assessing health care practices. Stockholm, Sweden: Swedish Council on Technology Assessment in Health Care, 1996. 81 p. SBU Report No. 119E.

(8) DiNicolantonio JJ, Di PP, Taylor RS, Hackam DG. Low sodium versus normal sodium diets in systolic heart failure: systematic review and meta-analysis. Heart. 2013;Epub 2013 Mar 12. Retraction in Heart. 2013 June;99(11):820.

(9) Parrinello G, Di Pasquale P, Licata G, Torres D, Giammanco M, Fasullo S, et al. Long-term effects of dietary sodium intake on cytokines and neurohormonal activation in patients with recently compensated congestive heart failure. J Card Fail. 2009;15(10):864-73.

(10) Paterna S, Fasullo S, Parrinello G, Cannizzaro S, Basile I, Vitrano G, et al. Short-term effects of hypertonic saline solution in acute heart failure and long-term effects of a moderate sodium restriction in patients with compensated heart failure with New York Heart Association class III (Class C) (SMAC-HF Study). Am J Med Sci. 2011;342(1):27-37.

(11) Paterna S, Parrinello G, Cannizzaro S, Fasullo S, Torres D, Sarullo FM, et al. Medium term effects of different dosage of diuretic, sodium, and fluid administration on neurohormonal and clinical outcome in patients with recently compensated heart failure. Am J Cardiol. 2009;103(1):93-102.

(12) Paterna S, Parrinello G, Fasullo S, Sarullo FM, DiPasquale P. Normal-sodium diet compared with low-sodium diet in compensated congestive heart failure: is sodium an old enemy or a new friend? Clin Sci (Lond). 2008;114(3):221-30.

(13) Aliti GB, Rabelo ER, Clausell N, Rohde LE, Biolo A, Beck da Silva L. Aggressive fluid and sodium restriction in acute decompensated heart failure: a randomized clinical trial. JAMA Intern Med. 2013;173(12):1058-64.

(14) Arcand J, Ivanov J, Sasson A, Floras V, Al-Hesayen A, Azevedo ER, et al. A high-sodium diet is associated with acute decompensated heart failure in ambulatory heart failure patients: a prospective follow-up study. Am J Clin Nutr. 2011;93(2):332-7.

(15) Lennie TA, Song EK, Wu JR, Chung ML, Dunbar SB, Pressler SJ, et al. Three gram sodium intake is associated with longer event-free survival only in patients with advanced heart failure. J Card Fail. 2011;17(4):325-30.

(16) Son YJ, Lee Y, Song EK. Adherence to a sodium-restricted diet is associated with lower symptom burden and longer cardiac event-free survival in patients with heart failure. J Clin Nurs. 2011;20(21-22):3029-38.

(17) van der Wal MHL, Jaarsma T, van Veldhuisen DJ. Non-compliance in patietns with heart failure: how can we manage it? Eur J Heart Fail. 2005;7(1):5-17.

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