A systematic review of trials evaluating success features of computerised clinical decision support systems

Stijn Van de Velde, Pavel Roshanov, Annemie Heselmans, Nicolas Delvaux, Tiina Kortteisto, Ilkka Kunnamo, Bert Aertgeerts, Per Olav Vandvik, Signe Flottorp, David Spitaels, Linn Brandt, Luis Marco Ruiz, Hanne Cloetens

Citation

Review question(s)
What is the impact of CCDSS features on process, clinical and economic outcomes of health services and on satisfaction of healthcare providers and/or patients?

Searches
We will search for relevant studies in the Cochrane Central Register of Controlled Trials (CENTRAL) through The Cochrane Library (http://mrw.interscience.wiley.com/cochrane/), MEDLINE and EMBASE through the Ovid platform (www.ovid.com) and CINAHL through EBSCO. To further identify relevant studies we will screen the reference lists of relevant systematic reviews, contact experts and use our own files.

We will not apply language or publication period restrictions.

Types of study to be included
We will include all randomized controlled trials, non-randomised trials and controlled before-after studies. We exclude interrupted time series design and observational study designs.

Condition or domain being studied
We consider CCDSS with any objective (e.g. diagnosis, treatment, test ordering, screening) for any health condition.

Participants/ population
We consider information generated through CCDSS that is directed at healthcare professionals or targeted at both professionals and patients. We also consider CCDSS directed at patients only if the objective is to change healthcare provider behaviour. We exclude studies were the population is limited to simulated patients or to the use of CCDSS by students only.

Intervention(s), exposure(s)
We define CCDSS as an information technology to aid clinicians and patients in making healthcare decisions, based on patient-specific data. The data can be produced both by healthcare professionals and patients. CCDSS can be Internet-based, installed on a local personal computer or a networked electronic health record, or function on a handheld device and comes in many types and functions. In this review we consider both computer generated decision support that is displayed on screen or provided on paper.

We exclude papers where compliance with the advice of CCDSS is mandatory. We exclude papers about sending reminder messages for attendance at upcoming healthcare appointments.

Comparator(s)/ control
We will include head-to-head studies regarding the impact of potential success features such as CCDSS directed at clinicians and/or patients, requirement to provide reasons for overriding advice, automatic provision versus on-
demand, advice linked to evidence-based information, endorsement by opinion leaders, timing or frequency of the decision support, training in use of CCDSS. Co-interventions are allowed if they are similar in the two groups.

We also include trials with CCDSS in both arms that evaluate the effect of any adjacent interventions to the CCDSS.

**Context**
We consider studies conducted in any healthcare setting. We exclude papers where the CCDSS is evaluated in simulated settings.

**Outcome(s)**

**Primary outcomes**
The trials needs to include assessment of at least one outcome according to the main categories suggested by the Cochrane Effective Practice and Organisation of Care (EPOC) review group (http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/06%20What%20outcomes%20should%20be%20reported%20in%20EPOC%20reviews%202013%2008%2012.pdf):

Patient outcomes, quality of care, utilisation or coverage of services, resource use, health care provider outcomes, social outcomes, equity, adverse effects.

**Secondary outcomes**
Satisfaction of healthcare providers and/or patients.

**Data extraction, (selection and coding)**
Four reviewers will individually extract data from the selected studies. The reviewers will use the EPOC data collection checklist (http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/datacollectionchecklist.pdf) and modify it to the needs of this review. The EPOC checklist will be used in combination with a framework of success features for CCDSS that is developed within the GUIDES project. The quality of the data extraction will be cross-checked.

**Risk of bias (quality) assessment**
Two reviewers will independently evaluate the study quality with the Cochrane Risk of Bias tool. We will use the GRADE approach to assess the level of evidence of the body of evidence for every comparison/outcome.

In addition, the reviewers will also evaluate if any implementation errors were present in the conduct of the study. With implementation errors, we refer to unintended technical or human issues that might affect the ability of CCDSS to fulfil its intended task.

**Strategy for data synthesis**
If this appropriate we will conduct meta-analyses using techniques as described in the Cochrane Handbook. However, we anticipate that standard meta-analysis techniques will not be appropriate given that we expect to find heterogeneous data coming from both cluster randomised trials and trials randomising healthcare providers or patients.

To combine the study results for the comparisons evaluated in this review, we will report the median improvement and interquartile range across the selected studies. This technique has been applied in Cochrane reviews on the effect of reminders: Shojania KG, Jennings A, Mayhew A, Ramsay CR, Eccles MP, Grimshaw J. The effects of on-screen, point of care computer reminders on processes and outcomes of care. Cochrane Database of Systematic Reviews 2009, Issue 3.

**Analysis of subgroups or subsets**
Subgroup analysis will be decided post hoc. This might include the following groups: decision support delivered on screen versus on paper, major health informatics institution versus other, homegrown systems versus commercial systems.

**Dissemination plans**
We will write a detailed report of the systematic review and submit it for publication in a leading journal in this
domain.

Contact details for further information
Dr Van de Velde
Norwegian Institute of Public Health, PO Box 4404 Nydalen, N-0403 Oslo Norway
stijn.vandevelde@fhi.no

Organisational affiliation of the review
Norwegian Institute of Public Health
www.fhi.no

Review team
Stijn Van de Velde, Norwegian Institute of Public Health
Pavel Roshanov, McMaster University
Annemie Heselmans, Department of Public Health and Primary Care, Katholieke Universiteit Leuven
Nicolas Delvaux, Department of Public Health and Primary Care, Katholieke Universiteit Leuven
Tiina Kortteisto, Tampere University Hospital
Professor Ilkka Kunnamo, Duodecim, Scientific Society of Finnish Physicians
Professor Bert Aertgeerts, Department of Public Health and Primary Care, Katholieke Universiteit Leuven
Professor Per Olav Vandvik, MAGIC Non-Profit Research and Innovation Programme
Professor Signe Flottorp, Norwegian Institute of Public Health
David Spitaels, Department of Public Health and Primary Care, Katholieke Universiteit Leuven
Linn Brandt, MAGIC Non-Profit Research and Innovation Programme
Luis Marco Ruiz, Norwegian Centre for Ehealth Research
Hanne Cloetens,

Anticipated or actual start date
28 January 2016

Anticipated completion date
30 June 2017

Funding sources/sponsors
This project has received funding from the EU’s Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 654981

Conflicts of interest
Two authors (IK, POV) are involved in the development of computerised clinical decision support systems (CCDSS). The other authors have no actual or potential conflicts of interests.

Language
English

Country
Belgium, Canada, Finland, Norway

Subject index terms status
Subject indexing assigned by CRD

Subject index terms
Computers; Decision Support Systems, Clinical; Humans
Stage of review
Ongoing

Date of registration in PROSPERO
28 January 2016

Date of publication of this revision
10 April 2017

Stage of review at time of this submission

<table>
<thead>
<tr>
<th>Preliminary searches</th>
<th>Started</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Piloting of the study selection process</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Formal screening of search results against eligibility criteria</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Data extraction</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Risk of bias (quality) assessment</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Data analysis</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

PROSPERO
International prospective register of systematic reviews

The information in this record has been provided by the named contact for this review. CRD has accepted this information in good faith and registered the review in PROSPERO. CRD bears no responsibility or liability for the content of this registration record, any associated files or external websites.