



August 2016 – SUPPORT Summary of a systematic review

## Does Internet based learning in the health professions improve learning outcomes?

Internet based learning is increasingly used in the training and ongoing education of health professionals. Concerns about the effects of this medium of teaching and learning have stimulated a large body of research. This summary describes a review and meta-analysis of research on the effectiveness of internet based learning by health professions.

### Key messages

- **Internet-based learning methods compared with no intervention may improve health professionals' knowledge, but it is not known whether they improve skills and behaviours of health professionals, or if they lead to beneficial effects on patients.**
  - Practise exercises, tutorials, online discussions and longer duration courses may improve the effects of internet-based learning.
- **It is not known whether Internet-based learning by health professions improves knowledge or other outcomes when compared to other forms of teaching and learning.**



### Who is this summary for?

People who make decisions about use of the internet for learning in health professions

#### ! This summary includes:

- **Key findings** from research based on a systematic review
- **Considerations about the relevance of this research** for low-income countries

#### X Not included:

- Recommendations
- Additional evidence not included in the systematic review
- Detailed descriptions of interventions or their implementation

### This summary is based on the following systematic review:

Cook DA, Levinson AJ, Garside S, et al. Internet-based learning in the health professions: a meta-analysis. *JAMA* 2008; 300:1181-96.

### What is a systematic review?

A summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise the relevant research, and to collect and analyse data from the included studies

**SUPPORT** was an international project to support the use of policy relevant reviews and trials to inform decisions about maternal and child health in low- and middle-income countries, funded by the European Commission (FP6) and the Canadian Institutes of Health Research.

**Glossary of terms used in this report:**  
[www.supportsummaries.org/glossary-of-terms](http://www.supportsummaries.org/glossary-of-terms)

**Background references on this topic:**  
See back page

# Background

Internet-based learning has become a popular approach to medical education since the advent of the World Wide Web in 1991. It permits learners to participate at a time and place convenient to them, facilitates innovation in instructional methods, and potentially allows instruction to be tailored to the individuals needs.

Several studies have been undertaken to assess the effectiveness of internet-based learning. This review included studies of the use of internet-based learning at any stage in training or practice by health professionals. The authors also sought to determine factors that could explain differences in effect across participants, settings, interventions, outcomes and study designs.

## How this summary was prepared

After searching widely for systematic reviews that can help inform decisions about health systems, we have selected ones that provide information that is relevant to low-income countries. The methods used to assess the reliability of the review and to make judgements about its relevance are described here: [www.supportsummaries.org/how-support-summaries-are-prepared/](http://www.supportsummaries.org/how-support-summaries-are-prepared/)

## Knowing what's not known is important

A reliable review might not find any studies from low-income countries or might not find any well-designed studies. Although that is disappointing, it is important to know what is not known as well as what is known.

A lack of evidence does not mean a lack of effects. It means the effects are uncertain. When there is a lack of evidence, consideration should be given to monitoring and evaluating the effects of the intervention, if it is used.

## About the systematic review underlying this summary

**Review objective:** To assess the effects of internet-based learning by health professionals

| Types of                                 | What the review authors searched for  | What the review authors found  |
|--|---|--|
| <b>Study designs &amp; Interventions</b> | Internet based learning for health professionals at any stage of training or practice                               | 201 studies (including observational and experimental designs) of internet based learning for health professionals, addressing a wide range of topics, and using a range of modalities for teaching and learning |
| <b>Participants</b>                      | Health profession learners (including students and practising physicians, nurses, dentists, pharmacists and others) | Health profession learners   |
| <b>Settings</b>                          | All settings and languages  | All settings   |
| <b>Outcomes</b>                          | Satisfaction; learning (knowledge, attitudes, skills); behaviours or effects on patients                            | Knowledge, skills, behaviours and effects on patients, satisfaction  |

**Date of most recent search:** January 2008

**Limitations:** The review is from 2008 and the studies up to 2007. New information is likely to be available.

Cook DA, Levinson AJ, Garside S, et al. Internet-based learning in the health professions: a meta-analysis. JAMA 2008; 300:1181-96.

# Summary of findings

Findings are reported separately for the two main comparisons – internet-based learning compared to no intervention and compared to non-internet-based learning. Key findings of sub-analyses are also reported.

## 1) Internet based learning compared to no intervention

Internet based learning was compared to no learning intervention for health professionals. Satisfaction outcomes were not reported, as no studies reported meaningful outcomes of this type.

- **Internet-based learning may improve knowledge. The certainty of this evidence is low.**
- **It is not known if they improve skills, behaviours or patient care when compared to no intervention. The certainty of this evidence is very low.**
- **Practise exercises may enhance skills acquisition, but not knowledge or behaviours. The certainty of this evidence is low.**
- **Tutorials, longer duration courses and online peer discussions may improve behaviours and effects on patient care. The certainty of this evidence is low.**

### About the certainty of the evidence (GRADE) \*

⊕⊕⊕⊕

**High:** This research provides a very good indication of the likely effect. The likelihood that the effect will be substantially different<sup>†</sup> is low.

⊕⊕⊕○

**Moderate:** This research provides a good indication of the likely effect. The likelihood that the effect will be substantially different<sup>†</sup> is moderate.

⊕⊕○○

**Low:** This research provides some indication of the likely effect. However, the likelihood that it will be substantially different<sup>†</sup> is high.

⊕○○○

**Very low:** This research does not provide a reliable indication of the likely effect. The likelihood that the effect will be substantially different<sup>†</sup> is very high.

\* This is sometimes referred to as 'quality of evidence' or 'confidence in the estimate'.

<sup>†</sup> Substantially different = a large enough difference that it might affect a decision

See last page for more information.

| Internet-based learning compared to no intervention  |   |                                   |
|--|---|-----------------------------------|
| <b>People</b>  | Health professionals  |                                   |
| <b>Settings</b>  | Classroom or practice   |                                   |
| <b>Intervention</b>  | Internet-based learning   |                                   |
| <b>Comparison</b>  | No intervention   |                                   |
| Outcomes   | Impact<br>Standardised mean differences   | Certainty of the evidence (GRADE) |
| <b>Knowledge</b>   | <p>There was a large effect on knowledge outcomes.<br/>Pooled effect size 1.00 (95% CI 0.90 to 1.10)</p> <p>High interactivity, ongoing access to course materials, online discussion, and practice exercises were not associated with larger effects.</p> <p>High quality studies were associated with smaller effects.<br/>Pooled effect size 0.71 (95% CI 0.51-0.92)</p> | <p>⊕⊕○○<br/>Low</p>               |
| <b>Skills</b>  | <p>Overall, the effect on skills was uncertain.<br/>Pooled effect size 0.85 (95% CI 0.49 to 1.20).</p> <p>Practice exercises were associated with larger effects.<br/>Pooled effect size 1.01 (95% CI 0.60-1.43)</p> <p>High interactivity, repetition, and online discussion were not associated with larger effects.</p>  | <p>⊕○○○<br/>Very low</p>          |
| <b>Behaviours and patient care</b>   | <p>Overall, the effects on behaviours and patient care were uncertain.<br/>Pooled effect size 0.82 (95% CI 0.63 to 1.20)</p> <p>Tutorials, longer duration courses and online peer discussion were associated with larger effects.</p>  | <p>⊕○○○<br/>Very low</p>          |
| GRADE: GRADE Working Group grades of evidence (see above and last page). CI = confidence interval. |   |                                   |

## 2) Internet-based learning compared to non-internet-based learning

Internet-based learning by health professionals was compared to alternative instructional media, including face-to-face teaching and learning.

- It is not known whether internet-based learning improves knowledge, satisfaction, skills, or patient care compared to non-internet-based learning. The certainty of this evidence is very low.
- Short courses and single instance learning interventions may provide greater learner satisfaction. The certainty of this evidence is low.
- Online discussion and longer duration courses may have a greater effect on knowledge. The certainty of this evidence is low.

| Internet-based learning compared to non-internet-based learning                                    |   |                                   |
|--|---|-----------------------------------|
| <b>People</b>  | Health professionals  |                                   |
| <b>Settings</b>  | Classroom or practice   |                                   |
| <b>Intervention</b>  | Internet-based learning   |                                   |
| <b>Comparison</b>  | Non-internet-based learning interventions   |                                   |
| Outcomes   | Impact<br>Standardised mean differences   | Certainty of the evidence (GRADE) |
| <b>Knowledge</b>   | Overall, the effect on knowledge was uncertain.<br>Pooled effect size 0.12 (95% CI 0.003 to 0.24)<br><br>Internet courses using online discussion and longer courses were associated with larger effects.                                     | ⊕○○○<br>Very low                  |
| <b>Skills</b>  | Overall, the effect on skills was uncertain.<br>Pooled effect size 0.09 (95% CI -0.26 to 0.44)<br><br>High levels of interactivity, practice exercises and peer discussion were associated with larger effects.                               | ⊕○○○<br>Very low                  |
| <b>Behaviours and patient care</b>   | Overall, the effect on behaviours and patient care was uncertain.<br>Pooled effect size 0.51 (95% CI -0.24 to 1.25)<br><br>Online discussion and single instance interventions were associated with larger effects.                           | ⊕○○○<br>Very low                  |
| <b>Satisfaction</b>  | Overall, the effect on satisfaction was uncertain.<br>Pooled effect size 0.10 (95% CI -0.12 to 0.32)<br><br>Short courses and single instance rather than ongoing access in-internet-based interventions were associated with larger effects. | ⊕○○○<br>Very low                  |
| GRADE: GRADE Working Group grades of evidence (see above and last page). CI = confidence interval. |   |                                   |

# Relevance of the review for low-income countries

| → Findings   | ▷ Interpretation*   |
|--|---|
| APPLICABILITY  |   |
| → <b>Studies in all languages were included, but authors did not indicate whether this included studies from low-income countries.</b>   | ▷ <i>The findings may be relevant to countries that have easy and reliable access to the internet.</i>  |
| EQUITY   |   |
| → <b>Impacts on equity were not reported.</b>  | ▷ <i>Internet-based learning could improve access to learning for students and health professionals in rural communities and other settings where travel for training is difficult.</i><br>▷ <i>Internet-based learning may increase equity where face-to-face learning is not an option for students and health professionals. However, it may also decrease equity for health professionals in rural communities, if access to the internet is worse than it is in urban areas.</i> |
| ECONOMIC CONSIDERATIONS  |   |
| → <b>No studies reported costs or cost-effectiveness.</b>  | ▷ <i>The use of any internet-based learning interventions should include costing.</i>   |
| MONITORING & EVALUATION  |   |
| → <b>A wide range of study designs and methods were used, with heterogeneous results.</b><br>→ <b>The effects of internet-based learning interventions in low-income countries is uncertain.</b> | ▷ <i>The use of internet-based learning interventions in low-income countries should be monitored and the effects of these interventions should be evaluated.</i>   |

\*Judgements made by the authors of this summary, not necessarily those of the review authors, based on the findings of the review and consultation with researchers and policymakers in low-income countries. For additional details about how these judgements were made see: [www.supportsummaries.org/methods](http://www.supportsummaries.org/methods)

# Additional information

## Related literature

Cook DA, Levinson AJ, Garside S, et al. Instructional design variations in internet-based learning for health professions education: a systematic review and meta-analysis. *Acad Med* 2010; 85:909–22.

Ruiz JG, Mintzer MJ, Leipzig RM. The Impact of e-learning in medical education. *Acad Med* 2006; 81:207–12.

## This summary was prepared by

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## Conflict of interest

None declared. For details, see: [www.supportsummaries.org/coi](http://www.supportsummaries.org/coi)

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This summary has been peer reviewed by: Fernando Althabe and David Cook.

## This review should be cited as

Cook DA, Levinson AJ, Garside S, et al. Internet-based learning in the health professions: a meta-analysis. *JAMA* 2008; 300:1181–96.

## The summary should be cited as

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## About certainty of the evidence (GRADE)

The “certainty of the evidence” is an assessment of how good an indication the research provides of the likely effect; i.e. the likelihood that the effect will be substantially different from what the research found. By “substantially different” we mean a large enough difference that it might affect a decision. These judgements are made using the GRADE system, and are provided for each outcome. The judgements are based on the study design (randomised trials versus observational studies), factors that reduce the certainty (risk of bias, inconsistency, indirectness, imprecision, and publication bias) and factors that increase the certainty (a large effect, a dose response relationship, and plausible confounding). For each outcome, the certainty of the evidence is rated as high, moderate, low or very low using the definitions on page 3.

**For more information about GRADE:**  
[www.supportsummaries.org/grade](http://www.supportsummaries.org/grade)

## SUPPORT collaborators:

**The Cochrane Effective Practice and Organisation of Care Group (EPOC)** is part of the [Cochrane Collaboration](http://www.cochrane.org). The Norwegian EPOC satellite supports the production of Cochrane reviews relevant to health systems in low- and middle-income countries. [www.epocoslo.cochrane.org](http://www.epocoslo.cochrane.org)

**The Evidence-Informed Policy Network (EVIPNet)** is an initiative to promote the use of health research in policymaking in low- and middle-income countries. [www.evipnet.org](http://www.evipnet.org)

**The Alliance for Health Policy and Systems Research (HPSR)** is an international collaboration that promotes the generation and use of health policy and systems research in low- and middle-income countries. [www.who.int/alliance-hpsr](http://www.who.int/alliance-hpsr)

**Norad**, the Norwegian Agency for Development Cooperation, supports the Norwegian EPOC satellite and the production of SUPPORT Summaries. [www.norad.no](http://www.norad.no)

**The Effective Health Care Research Consortium** is an international partnership that prepares Cochrane reviews relevant to low-income countries. [www.evidence4health.org](http://www.evidence4health.org)

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