

Health Literacy Interventions and Outcomes: an Updated Systematic Review

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Acknowledgements

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Background

- In 2004, AHRQ released the results of a systematic evidence review on literacy and health outcomes
- This report showed:
 - Low health literacy is related poorer health outcomes
 - Health literacy interventions “show promise for improving patient health and receipt of healthcare services”

Background

- Several national organizations have promoted health literacy as a research priority
- The research community has responded with new work
- To synthesize new work, AHRQ commissioned an update to its 2004 systematic evidence review

Questions Addressed

- Key Question 1: Are health literacy skills related to
 - (a) Use of health care services?
 - (b) Health outcomes?
 - (c) Costs of health care?
 - (d) Disparities in health outcomes or health care service use according to race, ethnicity, culture, or age?

- Key Question 2: For individuals with low health literacy skills, what are effective interventions to
 - (a) Improve use of health care services?
 - (b) Improve health outcomes?
 - (c) Affect the costs of health care?
 - (d) Improve health outcomes and/or health care service use among different racial, ethnic, cultural, or age groups?

Overview of Methods

- **Search Strategy:** MEDLINE[®] (2003-March 2009), CINAHL, PsychINFO, ERIC, the Cochrane Library
- **Inclusion of articles:** 2 independent reviewers reviewed titles/abstracts/articles
- **Quality rating of studies:** 2 independent reviewers, with focus on selection bias, measurement bias, confounding, power
- **Grading of overall literature:** research team, with focus on risk of bias, consistency, directness, precision

Specific Quality Rating Criteria For Articles

- Selection bias?
 - Method for Randomization?
 - Allocation Concealed?
 - Creation of Comparable Study Groups?
 - Maintenance of Comparable Study Groups?
 - Intent to Treat Analysis?
- Measurement bias?
 - Valid and Reliable Health Literacy Measure?
 - Valid and Reliable Outcome Measure?
 - Outcome Measures Equally Applied?
 - Blinding of Patients, Providers, and Outcome Assessors?
- Confounding?
 - Appropriate control of confounding?
- Power
 - Adequate sample size?

Results for Key Question 2: Effect of Interventions*

*Original Search only; does not
include update search through May
2010

Included Studies

- 33 fair/good quality studies were included in the review*:
 - 19 RCTs, 2 cRCTs, 12 quasi-experimental studies
 - 14 used one specific low literacy strategy/19 used a mixture of strategies in their intervention
 - 13 stratified results by health literacy level

* 7 poor quality studies were excluded from analysis

Effects of Interventions Using Single Design Strategies

Grouped results in to the following categories:

- Alternative document design (n=2)
- Alternative numerical presentation (n=1)
- Additive and alternative pictorial representation (n=6)
- Alternative media (n=1)
- Alternative readability and document design (n=4)
- Physician notification of literacy status (n=1)

Effects of Interventions Using Single Design Strategies

- In aggregate, strength of evidence was low.
- Several interventions improved comprehension in 1 or a few studies:
 - presenting only essential information (i.e. hospital death rates without other distracting information)
 - presenting essential information first (i.e. hospital death rates before consumer satisfaction)
 - presenting quality information with the higher number indicating better quality (i.e. “nurses per patient” rather than “patients per nurse”)
 - presenting information in pictograms in grouped rather than random format

Effects of Interventions Using Multiple Design Features

- Moderate strength of evidence that some interventions change health care service use
 - Intensive self-management and adherence interventions (n=4) reduced ED visits and hospitalizations
 - Educational interventions or cues for screening (n=2) increased colorectal and prostate cancer screening*

*benefits of increased prostate screening are unclear

Effects of Interventions Using Multiple Design Features

- Moderate strength of evidence that some interventions change some health outcomes
 - Self-management interventions (n=3) increased self-management behavior
 - in only study with stratified analysis effect greater in high literacy group
 - Intensive disease (not self) management programs (n=5) reduced disease prevalence and severity

Effects of Interventions Using Multiple Design Features

- Low strength of evidence for the effect of interventions on:
 - Knowledge (n=9)
 - Self-efficacy (n=9)
 - Adherence (n=4)
 - Quality of life (n =4)
- Insufficient evidence on:
 - Behavioral intent
 - Health-related skills
 - Cost
 - Disparities

Effects of Interventions Using Multiple Design Features

- Common components of effective interventions:
 - High intensity
 - Theory basis
 - Pilot testing
 - Emphasis on skill building
 - Delivery by a health professional

Effects of Interventions Using Multiple Design Features

- Intermediate outcomes changing in studies that changed distal outcomes:
 - Knowledge
 - Self Efficacy
 - Behavior

Emerging opportunities for future
health literacy interventions:
*A systematic literature review
and application of the RE-AIM
framework*

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Rationale for Review

- No review of health literacy literature has systematically addressed or reported on issues related to external validity
- Few behavioral intervention trials report on critical generalizability indicators (Glasgow et al., 2004; White et al., 2008; Akers et al. 2010)
- Public health impact

Background RE-AIM Framework

- **R**each
- **E**ffectiveness/ Efficacy
- **A**doption
- **I**mplementation
- **M**aintenance

www.re-aim.org

Glasgow RE, et al. *Am J Public Health*. 1999;89:1323-1327

Glasgow RE, et al. *Am J Public Health*. 2010 ;34(6):833-40

Aims of Systematic Review

1. To determine the degree to which health literacy intervention studies reported on **internal and external validity** indicators that could inform **research to practice translation**
2. To identify **methodological gaps** related to the research design, evaluation, and reporting

Overview of Methods

- Search strategy
- Inclusion/exclusion criteria, n=27 articles
 - Randomized controlled trial (n=17)
 - Quasi experimental (n=10)
- Data abstraction
 - Operational definitions of RE-AIM dimensions (Estabrooks et al., 2003; White et al., 2008)
- Quality of reporting summarized using counts and percents

Results: Overall (n=27)

RE-AIM dimension	Number of scored components	Proportion reporting
Reach	5	68%
Efficacy/Effectiveness	4	56%
Adoption	6	36%
Implementation	3	28%
Maintenance	3	6%

Across 21 scored components
Range: 4-12
Mean (SD): 8.6 (1.6)

Quality of Reporting	Number of studies
Good (15-20)	0
Fair (8-14)	20
Poor (0-7)	7

Results: Reach

	Proportion reporting
Reach	68%
Method to identify target population	93%
Inclusion criteria	96%
Exclusion criteria	74%
Sample size and participation rate	44%
Characteristics of non-participants	30%

Good examples (all Reach components):

- Murray, et al. *Ann Intern Med.* 2007;146(10):714-725
- Rudd, et al. *Patient Educ Couns.* 2009;75(3):334-39
- Schillinger, et al. *Health Educ Behav.* 2008;35(5):664-82

Results: Efficacy/Effectiveness

	Proportion reporting
Efficacy/effectiveness	56%
Measures/results for at least one follow-up	100%
Percent attrition	78%
Intent-to-treat analysis	22%
Quality of life	22%

Good examples (all Efficacy/effectiveness components):

- Murray, et al. *Ann Intern Med.* 2007;146(10):714-725
- Schillinger, et al. *Diabetes Care.* 2009;32(4):559-566

Results: Adoption

	Proportion reporting
Adoption	36%
Description of intervention location	100%
Level of expertise of the delivery agent	72%
Inclusion/exclusion criteria of delivery agents or setting	18%
Description of staff who delivered the intervention	12%
Adoption rate of delivery agent or setting	8%
Method to identify delivery agent	4%

Good examples (4 of 6 components):

- Ferreria, et al. *J Clin Oncol*. 2005;23(7):1548-54.
- Schillinger, et al. *Health Educ Behav*. 2008;35(5):664-82

Results: Implementation

	Proportion reporting
Implementation	28%
Intervention duration and frequency	63%
Extent protocol delivered as intended	15%
Measures of cost implementation	7%

Good examples (duration/frequency & extent delivered):

- Davis, et al. *Patient Educ Counseling*. 2008;72(1):56-62
- Schillinger, et al. *Diabetes Care*. 2009;32(4):559-66

Good examples (cost):

- Bosworth, et al. *Ann Intern Med*. 2009;151(10):687-95
- Murray, et al. *Ann Intern Med*. 2007;146(10):714-725

Results: Maintenance

	Proportion reporting
Maintenance	6%
Outcome assessed ≥ 6 months following completion of intervention	11%
Program still in place	7%
Measures of cost maintenance	0%

Good examples (individual outcomes ≥ 6 months):

- Bosworth, et al. *Ann Intern Med.* 2009;151(10):687-95
- Dewalt, et al. *BMC Health Services Research.* 2006;6(30)
- Rudd, et al. *Patient Educ Counseling.* 2009;75(3):334-9

Other Issues and Take Home Points

- Moderating and mediating effects of health literacy on outcomes
- Both internal AND external validity indicators inform research to practice translation
- Diversity of settings
- Reaching the target population
- Theoretical frameworks
- Limitations of review

For Questions

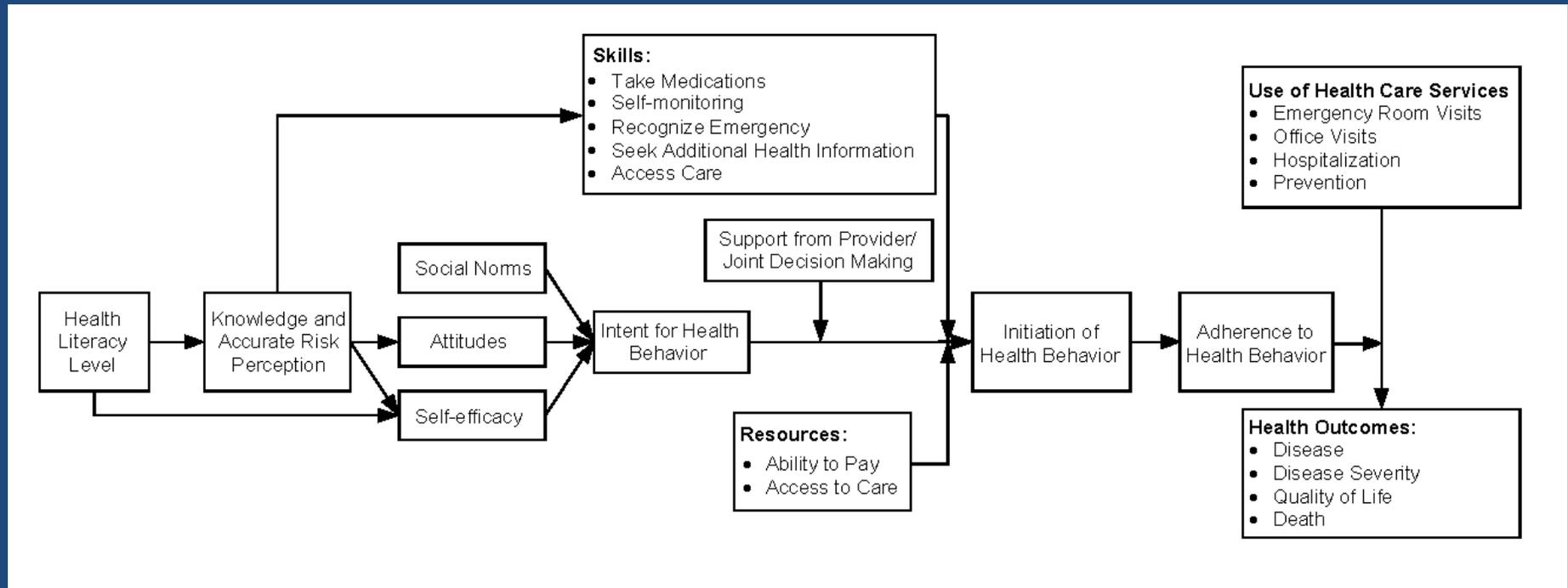
Observed Limitations in this Literature

- Methodological
 - Lack of comparison group
 - Measurement of multiple outcomes with insufficient attention to power for each
 - Failure to perform adequately controlled subgroup analyses by health literacy group

Observed Limitations in this Literature

- Conceptual:
 - Failure to perform subgroup analyses
 - Testing combined interventions with inability to determine effectiveness of individual components
 - Failure to report design features that would allow future content analyses

Logic Model



**Admissible evidence
(study design and
other criteria)**

Eligible study designs included

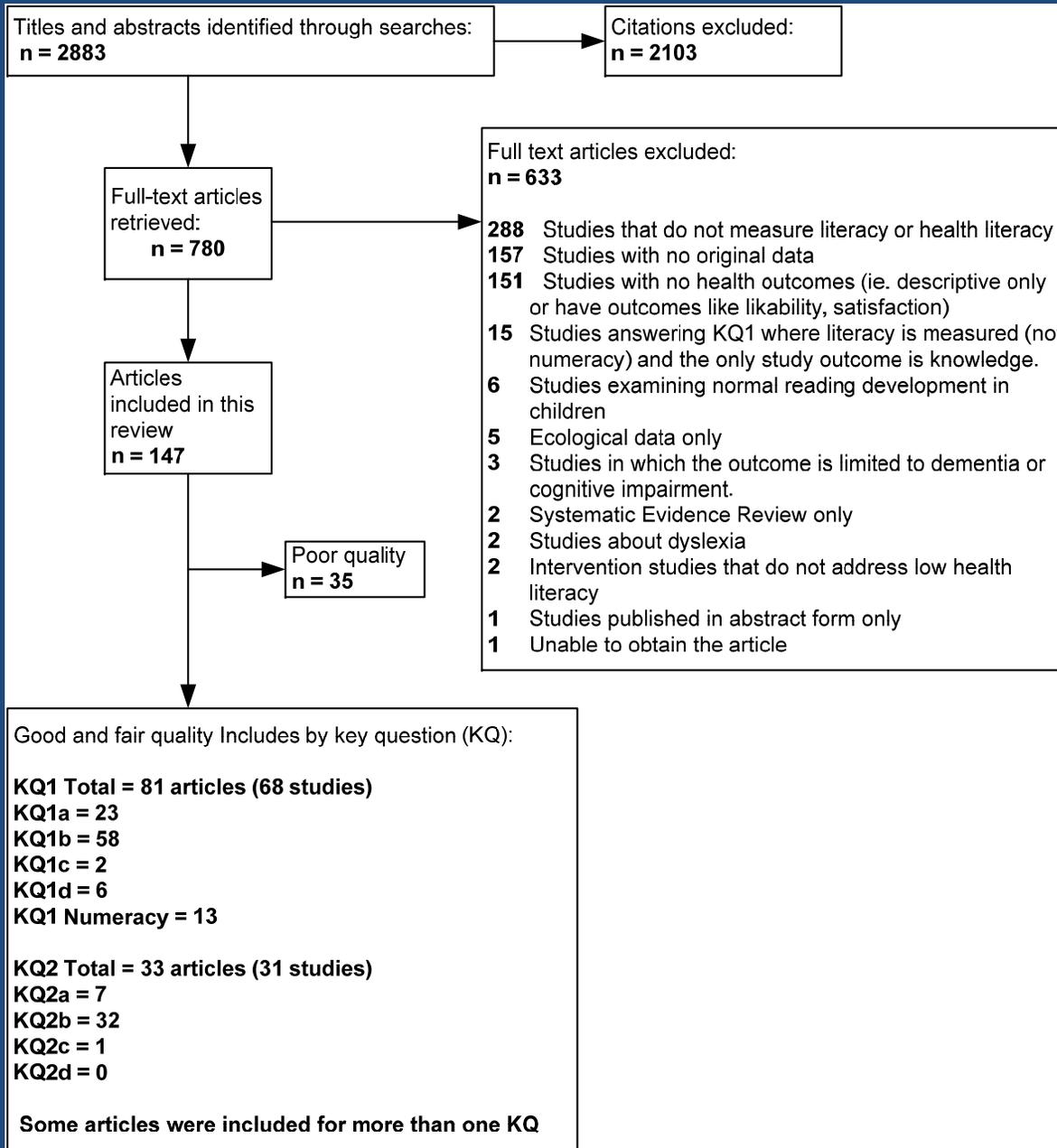
- before-and-after studies;
- controlled trials; and
- observational studies: prospective and retrospective cohort studies, case control studies; and cross-sectional studies.

Relevant outcomes must be able to be abstracted from data presented in the papers.

Sample sizes must be appropriate for the study question addressed in the paper; single case reports or small case series (fewer than 10 subjects) were excluded.

Other study exclusion criteria included studies

- of dyslexia and dementia.
- of normal reading development in children.
- with no health outcomes or no use of health care services.
- with an outcome limited to satisfaction or likeability of one intervention material compared to another, or attitudes, perceived social norms, or patient-physician interaction measures.
- solely about the readability of materials, but not about the relationship between health literacy and outcomes when readability is the focus of the intervention.
- in which health literacy, numeracy, or oral health literacy are not directly measured in the population by an objective measure or linked to outcomes at an individual level.
- in which the outcome is limited to dementia or cognitive impairment.
- in which health literacy is the exposure (KQ 1) and the only study outcome is knowledge.
- of the basic experimental science of reading ability (e.g., studies of brain function, including results from magnetic resonance imaging or electroencephalogram) or basic educational achievement.
- solely or chiefly for validation of an instrument.
- in which the intervention was not designed to address low health literacy or numeracy.



Results for Key Question 1: Impact of Health Literacy on Outcomes*

*Original Search only; does not
include update search through May
2010

Included Studies

- 96 studies (162 articles) met inclusion criteria for KQ1
 - 11 good quality
 - 57 fair quality
 - 28 poor quality (not considered further)
- Of 68 fair/good quality studies (94 articles),
 - Most cross-sectional, 15 cohorts
 - 81 articles examined health literacy, 13 numeracy, 0 oral literacy

Impact of Health Literacy on Outcomes

- High strength of evidence for*:
 - Higher mortality among seniors (n=2)
- Moderate strength of evidence for:
 - Poorer ability to interpret labels and health messages (n=3)
 - Greater probability of depression (n=8)
 - Lower quality of life among seniors (n=4)
 - Lower receipt of influenza vaccine (n=4)
 - Greater emergency care use (n=8)
 - Increased hospitalizations (n=5)

*Knowledge outcome excluded
b/c clearly related in 2004 review

Impact of Health Literacy on Outcomes

- Low Strength of Evidence for:
 - Preventive Screening
 - Access to Care
 - Self-efficacy
 - Behavior (healthy lifestyle, smoking, ETOH, sexual)
 - Adherence
 - Skill (taking meds)
 - Disease Prevalence/Severity (asthma, HTN, DM, Prostate Ca control, global health)
 - Quality of Life, non-seniors
 - Costs

Health Literacy as a Mediator

- Multiple studies (n=5) suggest that HL is a mediator between race and health outcomes

Impact of Numeracy on Outcomes

- Strength of Evidence low for:
 - Accuracy of risk perception (n=5)
 - Knowledge (n=4)
 - Skill in taking medicine (n=2)
 - Skill in interpreting health information (n=2)
 - Disease prevalence and severity (n=3)
- Strength of Evidence insufficient for:
 - Self-efficacy
 - Behavior
 - Cost
 - Disparities

Observed Limitations of Literature

- Methodological:
 - Small sample sizes with lack of power to detect differences among literacy subgroups
 - Wide variation in potential confounding variables included in multivariate analyses
 - Potential under and over-controlling

Observed Limitations of Literature

- Conceptual:
 - Lack of studies looking at mediators of the relationship between health literacy and health outcomes
 - Lack of studies looking at health disparities and cost
 - Lack of studies looking at numeracy, oral literacy, or a broader set of health literacy skills.