View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Elsevier - Publisher Connector

Asian Nursing Research 8 (2014) 172–181

Contents lists available at ScienceDirect

Asian Nursing Research

journal homepage: www.asian-nursingresearch.com

Review Article

Intervention Strategies Based on Information-Motivation-Behavioral Skills Model for Health Behavior Change: A Systematic Review

Sun Ju Chang, RN, PhD, [1] Suyoung Choi, RN, PhD, [2] Se-An Kim, RN, MSN, [3] Misoon Song, RN, PhD [4, *]

[1] Department of Nursing Science, Chungbuk National University, Cheongju, South Korea
[2] College of Nursing, Jeju National University, Jeju, South Korea
[3] College of Nursing, Seoul National University, Seoul, South Korea
[4] College of Nursing and The Research Institute of Nursing Science, Seoul National University, Seoul, South Korea

ARTICLE INFO

Article history:
Received 21 October 2013
Received in revised form
1 April 2014
Accepted 9 May 2014

Keywords:
behavioral research
health behavior
motivation
review

SUMMARY

Purpose: This study systematically reviewed research on behavioral interventions based on the information-motivation-behavioral skills (IMB) model to investigate specific intervention strategies that focus on information, motivation, and behavioral skills and to evaluate their effectiveness for people with chronic diseases.

Methods: A systematic review was conducted in accordance with the guidelines of both the National Evidence-based Healthcare Collaborating Agency and Im and Chang. A literature search was conducted using electronic databases. Randomized controlled trials that tested behavioral interventions based on the IMB model for promoting health behaviors among people with chronic diseases were included. Four investigators independently reviewed the studies and assessed the quality of each study. A narrative synthesis was used.

Results: A total of 12 studies were included in the review. Nine studies investigated patients with HIV/AIDS. The most frequently used intervention strategies were instructional pamphlets for the information construct, motivational interviewing techniques for the motivation construct, and instruction or role playing for the behavioral skills construct. Ten studies reported significant behavior changes at the first post-intervention assessment.

Conclusion: This review indicates the potential strength of the IMB model as a theoretical framework to develop behavioral interventions. The specific integration strategies delineated for each construct of the model can be utilized to design model-based interventions.

Copyright © 2014, Korean Society of Nursing Science. Published by Elsevier. All rights reserved.

Introduction

With the rapid worldwide increase in the prevalence of chronic diseases such as diabetes, hypertension, asthma, and HIV/AIDS, efforts have been made to develop and test appropriate interventions for preventing disease-related complications and improving the quality of life for patients with these diseases (Martin, Haskard-Zolneierek, & DiMatteo, 2010; Sabaté, 2003). Because behavioral changes are a core component of self-management and adherence, researchers and health care providers in health-related fields have emphasized the importance of behavior change (Newman, Steed, & Mulligan, 2008; Shumaker, Ockene, & Rieker, 2009). Consequently, several studies of people with chronic diseases have focused on behavioral interventions to improve self-management or adherence (Sabaté). Therefore, researchers developing behavioral interventions for individuals with chronic diseases have paid attention to behavioral theories, which can be used to increase the effectiveness and efficacy of behavioral interventions (Ammerman, Lindquist, Lohr, & Hersey, 2002; Martin et al., 2010; Noar, Benac, & Harris, 2007).

Behavioral theories such as the health belief model, the theory of reasoned action, the theory of planned behavior, the transtheoretical model, and the information-motivation-behavioral skills (IMB) model, all of which specify determinants of behavior that are potentially amenable to change, have frequently been used to develop behavioral interventions (Newman et al., 2008). In particular, the IMB

* Correspondence to: Misoon Song, RN, PhD, College of Nursing & The Research Institute of Nursing Science, Seoul National University, 28 Yougon-dong, Chongro-gu, Seoul, South Korea.
E-mail address: msong@snu.ac.kr

http://dx.doi.org/10.1016/j.anr.2014.08.002
1976-1317/Copyright © 2014, Korean Society of Nursing Science. Published by Elsevier. All rights reserved.

model has received considerable attention because it not only provides a relatively simple explanation for complex health behaviors but also identifies constructs (including information, motivation, and behavioral skills) that are needed for successful self-management or adherence among patients with chronic disease (Deakin, McShane, Cade, & Williams, 2005; Sabaté, 2003).

The IMB model, proposed by Fisher and Fisher (1992) to explain HIV-related behaviors, recognizes three constructs—information, motivation, and behavioral skills—needed to engage in a given health behavior, as specific individual determinants of behavior and behavioral change (Fisher & Fisher; Norton, 2009). According to this model, information is defined as "an initial prerequisite for enacting a health behavior" (Misovich, Martinez, Fisher, Bryan, & Catapano, 2003). This includes not only behavior-related information but also myths/heuristics that permit automatic or cognitively effortless behavior-related decision-making (Fisher, Fisher, & Harman, 2003; Norton). Motivation is composed of two factors: personal motivation, which includes beliefs about the intervention outcome and attitudes toward a particular health behavior (Fisher et al., 2003; Osborn, 2006), and social motivation, which includes the perceived social support or social norm for engaging in a particular behavior (Fisher et al.). Behavioral skills, the third determinant in the IMB model, are skills necessary for performing a particular health behavior. To facilitate behavioral change, behavioral skills in the IMB model emphasize the enhancement of an individual's objective skills and increasing perceived self-efficacy (Fisher et al.). As shown in Figure 1, information and motivation have direct effects on both behavioral skills and health behavior. Additionally, behavioral skills exert direct effects on health behavior (Fisher et al.).

Information, motivation, and behavioral skills as well as explicit relationships among these constructs are considered generalizable determinants of health behaviors. Therefore, the IMB model has been used as a theoretical basis for behavioral intervention studies across a variety of health behaviors (Carey et al., 1997; Fisher, Fisher, & Shuper, 2009; Fisher, Fisher, Amico, & Harman, 2006). However, though the number of behavioral interventions based on the IMB model has increased in fields related to health behavior changes, there is a need to delineate specific strategies that have been integrated into IMB model-based interventions and to find evidence of the effectiveness of the model in facilitating behavioral change for patients with chronic diseases. For this reason, the current study systematically reviewed studies on behavioral interventions based on the IMB model targeting patients with chronic diseases.

Methods

This systematic review was conducted in accordance with the guidelines of both the National Evidence-based Healthcare Collaborating Agency (Kim et al., 2011) and Im and Chang (2012).

Review questions

We addressed three review questions using the PICOS framework (Participants: people with chronic diseases; Interventions: behavioral interventions based on the IMB model; Comparators: none; Outcomes: behavioral and biological change; Study design: randomized controlled trials) (Centre for Reviews and Dissemination, 2008). Our research questions were as follows:

(a) What kinds of behaviors were targeted for change?
(b) How were the IMB model constructs (information, motivation, and behavioral skills) integrated into behavioral interventions, that is, what methods did the interventions employ for developing these constructs?
(c) What variables were used to evaluate outcomes, and did the interventions successfully induce changes in behavior?

Search strategies

To identify relevant studies, a search was conducted for articles that were (a) written in English or Korean and (b) published between 2000 and 2012 in peer-reviewed journals or as dissertations. A number of electronic databases were used, including the Cumulative Index for Nursing and Allied Health Literature (CINAHL), PubMed, ProQuest (including the ProQuest Dissertation and Theses Database), Google Scholar, and the Research and Information Sharing Service (RISS) for Korean studies. Combinations of keywords including "health", "behavior", "information", "motivation", and "behavioral skills" were used to search each database. Reference lists and bibliographies of the retrieved studies were searched. Appropriate publications were included in our analysis when they met the inclusion criteria. Gray literature, such as conference proceedings and government reports, was not included.

Selection of studies

The inclusion criteria used to select appropriate publications for the systematic review were as follows:

Types of studies

Randomized controlled trials that were (a) clearly described by the study authors as behavioral interventions based on the IMB model, (b) designed to test interventions, and (c) focused on health behaviors, including self-management and adherence, in patients with chronic diseases were included.

Types of participants

Studies with participants who were 18 years and older with chronic diseases were included.

Types of interventions

Behavioral interventions based on the IMB model that were delivered by health care providers and that were intended for people with chronic diseases were included. Intervention studies using at least two constructs of the IMB model (e.g., information and motivation) were also considered.

Types of outcomes

Primary outcomes of the studies were effects of the interventions, which were evaluated using both behavioral variables (with data from self-reported questionnaires) and biological variables (e.g., HIV viral load or HbA1c levels)

A two-step process was used to select studies for further analysis. First, the abstracts of all the retrieved studies were independently reviewed by four investigators. When the abstracts indicated that the studies were (a) described by the study authors as behavioral interventions based on the IMB model, (b) focused on health behaviors, (c) designed to test interventions, and (d) aimed at persons aged 18 years or older, the studies were included in the second step of the review process. Second, the same four investigators independently reviewed the full text of the selected studies. Studies identified as randomized controlled trials that focused on adherence related to chronic diseases were selected for the systematic review. Any disagreements between investigators were resolved through discussion.

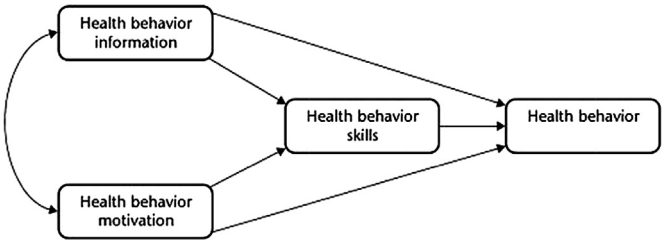

Figure 1. Information-motivation-behavioral skills (IMB) model. *Note*. Reprinted from *Social Psychological Foundations of Health and Illness* (p. 86), by W. A. Fisher, J. D. Fisher, and J. Harman, 2003. Maiden, MA: Blackwell. Copyright 2009 by Blackwell Publishing. Reprinted with permission.

Quality assessment

The investigators read the full texts of the studies that had been selected for review at the second step. The quality of each study was independently assessed using the critical appraisal checklist for experimental studies developed by the Joanna Briggs Institute (Pearson, Field, & Jordan, 2007). The four investigators discussed the results of the quality appraisal with each other to reach a consensus when any disagreements arose.

Data extraction

All included studies were sorted by targeted health behaviors (e.g., adherence to self-care behaviors or preventive behaviors) and analyzed according to the following two major categories: (a) contents and strategies of behavioral intervention according to each construct of the IMB model and (b) outcome variables (e.g., behavioral or biological) and effects of the interventions.

Data synthesis

The systematic review used a narrative synthesis approach, based on the framework suggested by the Centre for Reviews and Dissemination (2008). We did not conduct a meta-analysis due to heterogeneity among the included studies (Figure 2).

Results

Search results

A total of 3,971 abstracts were retrieved. Among these, 3,686 studies were excluded either because they were duplicates or irrelevant to the IMB model. In addition, 220 studies reporting descriptive research, structural equation modeling research, and/or secondary analyses were excluded. Ultimately, 65 studies were extracted in the first step. The second step excluded 53 studies that were not randomized controlled trials, were aimed at persons aged 17 years or younger, or were irrelevant to adherence related to chronic diseases. Thus, a total of 12 studies were selected for systematic review. Figure 2 depicts the literature retrieval process. Characteristics of the included studies are presented in Table 1.

Quality assessment results

All selected studies satisfied 7 of 11 criteria (e.g., random assignment, issues in outcome measures, appropriate statistical analysis, and issues with data from participants who withdrew). Three satisfied the criteria related to allocation concealment, one of which was single-blind (Cosio, 2008), and two were double-blind (Pearson et al., 2007; Purcell et al., 2007) (Table 2).

Review results

Targeted health behaviors

To identify targeted health behaviors, we classified the 12 studies according to disease type: HIV/AIDS, type 2 diabetes mellitus, coronary artery disease, and cervical or endometrial cancer. Then, targeted health behaviors of the 12 studies were categorized as adherence to self-care behaviors or prevention of risk behaviors. Nine studies were designed to promote antiretroviral medication adherence among individuals with HIV/AIDS (Margolin, Avants, Warburton, Hawkins, & Shi, 2003; Parsons, Golub, Rosof, & Holder, 2007; Pearson, Micek et al., 2007; Purcell et al., 2007; Sabin et al., 2010; Wagner et al., 2006) and/or prevent risky sexual behaviors

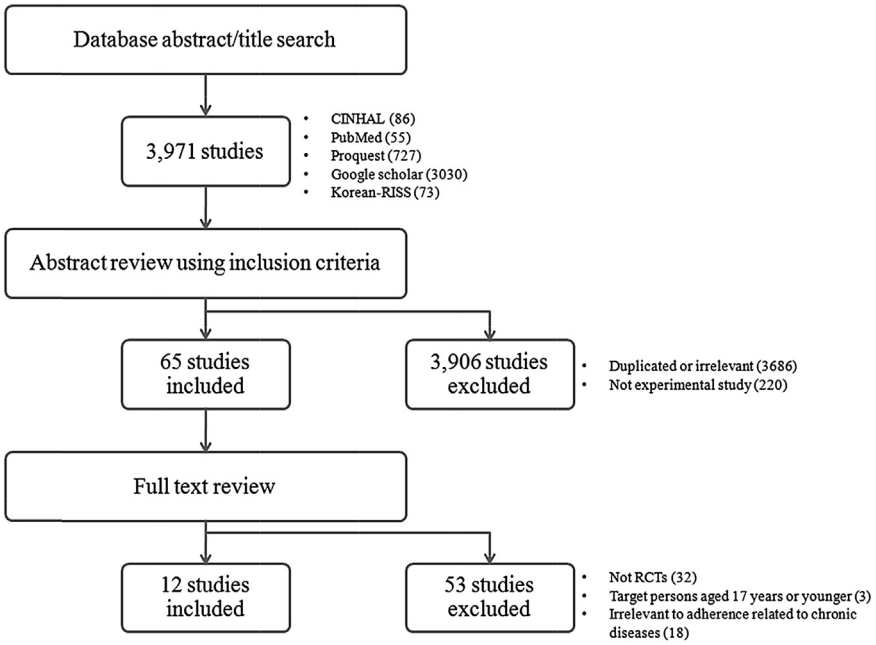

Figure 2. Flowchart of the systematic review process. *Note*. RCT = randomized controlled trial; CINAHL = Cumulative Index for Nursing and Allied Health Literature; RISS = Research and Information Sharing Service.

Table 1 *Characteristics of Studies Included in Review.*

Study	Participants	Target behavior	Strategies according to the IMB construct	Methods	Experimental conditions	Control conditions	Measurements	Outcomes
	▪ Population ▪ Sample size (*N*) ▪ Mean age (age range)			▪ Follow-up ▪ No. of study arms	▪ Interventions ▪ Delivery method ▪ No. of sessions ▪ Duration ▪ Interventionist	▪ Interventions ▪ Delivery method ▪ Session ▪ Duration ▪ Interventionist		
Cornman et al. (2008)	▪ HIV infected patients ▪ $N = 152$ (IG:103, CG:49) ▪ 34 years (18–58)	Risky sexual behavior	▪ IC: Discussion ▪ MC: Motivational interviewing ▪ BSC: Instruction	▪ 6-month ▪ Two arms	▪ Standard of care + Motivational interviewing ▪ 15-minute individual counseling ▪ Sessions: 2 ▪ Duration: 6 months ▪ Interventionist: 3 certified lay counselors	▪ Standard of care ▪ Individual counseling ▪ Sessions: 2 ▪ Duration: 6 months ▪ Interventionist: 2 certified lay counselors	▪ Sexual behavior (unprotected sex)	▪ At 6-month follow-up Effect (+)[a]: Sexual behavior
Cosio (2008)	▪ HIV sero-positive adults ▪ $N = 79$ (IG: 48, CG: 31) ▪ 44.0 years (22–64)	Risky sexual behavior	▪ IC: Brochure ▪ MC: Motivational interviewing ▪ BSC: Instruction	▪ Immediately ▪ Two arms	▪ Motivational interviewing + skill-building ▪ 1-hour telephone-delivered ▪ Sessions: 2 ▪ Duration: 2 weeks ▪ Interventionist: 11 Master's level trained students	▪ Skills-building only ▪ 1 hour telephone-delivered ▪ Sessions: 2 ▪ Duration: 2 weeks ▪ Interventionist: 11 Masters' level trained students	▪ Prevention information ▪ Motivation to reduce risky sexual behavior ▪ Risk reduction behavioral skills ▪ Condom use	▪ Immediately post intervention Effect (−)[b]: information, motivation, behavioral skills, behavior
Illa et al. (2010)	▪ Older HIV-positive adults ▪ $N = 241$ (IG: 149, CG: 92) ▪ IG: 50.82 years CG: 50.77 years	Risky sexual behavior	▪ IC: Brochure ▪ MC: Discussion ▪ BSC: Discussion	▪ 6-month ▪ Two arms	▪ ROADMAP intervention ▪ 1–2.5-hour group based ▪ Sessions: 4 ▪ Duration: not stated ▪ Interventionist: not stated	▪ Educational brochure, usual care ▪ Not stated ▪ Session: not stated ▪ Duration: not stated ▪ Interventionist: not stated	▪ Sexual risk (condom use) ▪ HIV knowledge ▪ Sexual self-efficacy	▪ At 6-month follow-up Effect (+)[a]: condom use Effect (−)[b]: HIV knowledge, self-efficacy
Jeffries et al. (2006)	▪ Women receiving external-beam radiotherapy for cervical or endometrial cancer ▪ $N = 47$ (IG: 26, CG: 21) ▪ IG: 39.46 years CG: 47.33 years	Adherence: vaginal dilation	▪ IC: Discussion ▪ MC: Counseling ▪ BSC: Instruction, Practice	▪ 6-week, 6-month, 12-month, 18-month 24-month ▪ Two arms	▪ Psycho-educational intervention ▪ 2-hour group-based ▪ Sessions: 2 ▪ Duration: 1 or 2 weeks ▪ Interventionists: a female clinical psychologist and a female oncology nurse	▪ Information-only ▪ 30-minute instructions ▪ Sessions: 1 ▪ Duration: One interaction ▪ Interventionist: a female radiotherapy nurse	▪ Compliance with vaginal dilation	▪ At 6-week follow-up Effect (+)[a]: Frequency of dilation (dilating 3×/week, 2×/week, at all) ▪ At 6-month follow-up Effect (+)[a]: Frequency of dilation (dilating at all) Effect (−)[b]: Frequency of dilation (dilating 3×/week, 2×/week) ▪ At 12-month follow-up Could not analyze because only 5 women participated ▪ At 18- and 24-month follow-up Could not analyze because all participants had dropped out of the study

(*continued on next page*)

Table 1 (*continued*)

Study	Participants	Target behavior	Strategies according to the IMB construct	Methods	Experimental conditions	Control conditions	Measurements	Outcomes
	▪ Population ▪ Sample size (*N*) ▪ Mean age (age range)			▪ Follow-up ▪ No. of study arms	▪ Interventions ▪ Delivery method ▪ No. of sessions ▪ Duration ▪ Interventionist	▪ Interventions ▪ Delivery method ▪ Session ▪ Duration ▪ Interventionist		
Margolin et al. (2003)	▪ HIV-seropositive injection drug users ▪ $N = 90$ (IG: 45, CG: 45) ▪ 41 years	Risky behavior: sexual, injection Adherence: ART	▪ IC: Counseling ▪ MC: Counseling ▪ BSC: Game, Role playing, Demonstration, Tailored Kits	▪ Immediately 3-month ▪ Two arms	▪ HIV + Harm Reduction Program ▪ 2-hour manual-guided group based + Enhanced Methadone Maintenance Program ▪ Sessions: 6 (bi-weekly) ▪ Duration: 6 months ▪ Interventionists: 2 counselors	▪ Enhanced Methadone Maintenance Program ▪ Daily methadone & weekly individual substance abuse counseling, case management ▪ Sessions: 6 ▪ Duration: 6 months ▪ Interventionists: not stated	▪ Risky sexual behavior ▪ Risky injection behavior ▪ Severity of addiction ▪ ART adherence	▪ At post intervention immediately Effect (+)[a]: Risky behavior (sexual, injection), ART adherence Effect (−)[b]: Severity of addiction ▪ At 3-month follow-up Effect (+)[a]: Risky behavior (sexual, injection), severity of addiction
Osborn et al. (2010)	▪ Type 2 diabetes Puerto Rican ▪ $N = 91$ (IG: 48, CG: 43) ▪ 57.6 years (> 18 years old)	Adherence: diabetes self-care	▪ IC: Discussion, Flip-chart ▪ MC: Motivational interviewing ▪ BSC: Role playing	▪ 3-month ▪ Two arms	▪ IMB-based self-care intervention ▪ 90-min group-based ▪ Sessions: 1 ▪ Duration: one interaction None ▪ Interventionist: bilingual medical assistant (Puerto Rican)	▪ Normal care ▪ Group-based didactic education ▪ Sessions: 1 ▪ Duration: one interaction ▪ Interventionist: bilingual diabetes community health worker (Puerto Rican)	▪ Food label reading ▪ Diet adherence ▪ Physical activity ▪ Glycemic control (HbA1C)	▪ At 3-month follow-up Effect (+)[a]: food label reading, diet adherence, HbA1C Effect (−)[b]: physical activity
Parsons et al. (2007)	▪ Hazardous drinkers with HIV ▪ $N = 143$ (IG: 103, CG: 49) ▪ 43.6 years (18–58)	Adherence: ART	▪ IC: Discussion ▪ MC: Motivational interviewing ▪ BSC: Tailored modules	▪ 3-month 6-month ▪ Two arms	▪ Project PLUS intervention + motivational interviewing + cognitive-behavior skill training ▪ 60-minute individually ▪ Sessions: 8 ▪ Duration: 12 weeks ▪ Interventionist: counselor with Master's degree	▪ Education condition (matched to the intervention for time & content) ▪ 60-minute didactic methods and structured discussions ▪ Sessions: 8 ▪ Duration: 12 weeks ▪ Interventionist: health educator	▪ Adherence (1) ART (2) Alcohol use ▪ CD4 count, HIV viral load	▪ At 3-month follow-up Effect (+)[a]: Adherence (1), CD4 count, viral load Effect (−)[b]: Adherence (2) ▪ At 6-month follow-up Effect (−)[b]: all measurements
Pearson, Micek et al. (2007)	▪ HIV Patients initiating ART ▪ $N = 350$ (IG: 175, CG: 175) ▪ IG: 35.6 years CG: 36.1 years	Adherence: ART	▪ IC: Teaching by peers ▪ MC: Social support groups ▪ BSC: Instruction	▪ Immediately 6-month 12-month ▪ Two arms	▪ Modified directly observed therapy (mDOT) intervention ▪ During morning weekday visit, individually ▪ Sessions: not stated ▪ Duration: 6 weeks ▪ Interventionist: Peers	▪ Standard care ▪ Not stated ▪ Sessions: not stated ▪ Duration: 6 weeks ▪ Interventionist: clinicians, social workers, peers	▪ Adherence (1) 7-day adherence (2) 30-day adherence ▪ CD4 count	▪ At post intervention immediately Effect (+)[a]: Adherence (1), (2) ▪ At 6-month follow-up Effect (+)[a]: Adherence (1), (2) Effect (−)[b]: CD4 count ▪ At 12-month follow-up Effect (+)[a]: Adherence (1), (2) Effect (−)[b]: CD4 count

Purcell et al. (2007)	▪ HIV-positive injection drug users ▪ $N = 966$ (IG: 486, CG: 480) ▪ 42.4 years	Risky behavior: sexual, injection Adherence: ART	▪ IC: Pamphlets, Poster ▪ MC: Not stated ▪ BSC: Tailored kits	▪ 3-month 6-month 12-month ▪ Two arms	▪ Peer mentoring intervention ▪ 2- to 4-hour group-based and individually-based ▪ Sessions: 10 ▪ Duration: 5 weeks ▪ Interventionist: 2 facilitators (males & females)	▪ Video discussion intervention ▪ 2- to 4-hour group-based and individually-based ▪ Sessions: 8 ▪ Duration: 5 weeks ▪ Interventionist: 4 facilitators (males & females)	▪ Sexual behavior ▪ Injection behavior ▪ Utilization of HIV care ▪ ART Adherence	▪ At 3-month follow-up Effect (−)[b]: all variables ▪ At 6-month follow-up Effect (−)[b]: all variables ▪ At 12-month follow-up Effect (−)[b]: all variables
Sabin et al. (2010)	▪ HIV-positive patients ▪ $N = 64$ (IG: 31, CG: 33) ▪ IG: 36.1 years CG: 35.1 years	Adherence: ART	▪ IC: Monitoring, counseling ▪ MC: Counseling ▪ BSC: Not stated	▪ Immediately ▪ Two arms	▪ Counseling using electronic drug monitor feedback ▪ 10–15 minute individually-focused discussion ▪ Session: 6 (monthly visits) ▪ Duration: 6 months ▪ Interventionist: 1/2–day period trained clinician or nurse	▪ Standard of care using self-reported adherence ▪ None ▪ Session: 6 (monthly visits) ▪ Duration: 6 months ▪ Interventionist: not stated	▪ ART adherence ▪ CD4 count and HIV viral load (HIV RNA)	▪ At post intervention immediately Effect (+)[a]: ART adherence, Change in CD4 Effect (−)[b]: CD4 count, HIV RNA
Wagner et al. (2006)	▪ Patients initiating or changing an ART regimen ▪ $N = 230$ (IG1: 75, IG2: 79, CG: 76) ▪ 39 years (21–70)	Adherence: ART	▪ IC: Instruction ▪ MC: Social support groups ▪ BSC: Instruction	▪ 1-month, 3-month, 6-month, 12-month ▪ Three arms	▪ Adherence intervention - IG1: Enhanced intervention (cognitive behavioral + a 2-week practice trial) - IG2: only cognitive-behavioral intervention ▪ 30–45 minutes individually ▪ Sessions: 5 ▪ Duration: not stated ▪ Interventionist: research nurse	▪ Usual clinical care ▪ Not stated ▪ Sessions: not stated ▪ Duration: not stated ▪ Interventionist: not stated	▪ Adherence (1) Percent of the prescribed doses taken (2) Percent of the prescribed doses taken within specified time windows ▪ CD4 count, HIV-1 RNA	▪ At 1-month follow-up Effect (+)[a]: Adherence (2) Effect (−)[b]: Adherence (1), CD4 count, HIV-1 RNA ▪ At 3-month follow-up Effect (−)[b]: all variables ▪ At 6-month follow-up Effect (+)[a]: Adherence (1) Effect (−)[b]: Adherence (2), CD4 count, HIV-1 RNA ▪ At 12-month follow-up Effect (−)[b]: all variables
Zarani et al. (2010)	▪ Coronary artery bypass graft patients ▪ $N = 152$ (IG^1: 75, CG^2: 77) ▪ 53.15 years (40–60)	Adherence: health advice	▪ IC: Handouts, educational film ▪ MC: Motivational interviewing ▪ BSC: Instruction	▪ 1-month, 3-month ▪ Two arms	▪ IMB-based intervention ▪ 120-minute group-based ▪ Sessions: 1 ▪ Durations: one interaction ▪ Interventionist: not stated	▪ Standard care + supportive counseling ▪ Not stated ▪ Sessions: not stated ▪ Durations: not stated ▪ Interventionist: not stated	▪ General adherence ▪ Specific adherence	▪ At 1-month follow-up Effect (+)[a]: general, specific adherence ▪ At 3-month follow-up Effect (+)[a]: general, specific adherence

Note. IG = intervention groups; CG = control groups; ART = antiretroviral therapy; IC = information construct; MC = motivation construct; BSC = behavioral skills construct; IMB = information-motivation-behavioral skills.

[a] The effects of the intervention in the original study were significant.

[b] The effects of the intervention in the original study were not significant.

Table 2 *Quality Appraisal Using Joanna Briggs Institute Critical Appraisal Checklist for Experimental Studies.*

	Quality criteria	Cornman et al. (2008)	Cosio (2008)	Illa et al. (2010)	Jeffries et al. (2006)	Margolin et al. (2003)	Osborn et al. (2010)	Parsons et al. (2007)	Pearson, Micek et al. (2007)	Purcell et al. (2007)	Sabin et al. (2010)	Wagner et al. (2006)	Zarani et al. (2010)
1	Was the assignment to treatment groups random?	√	√	√	√	√	√	√	√	√	√	√	√
2	Were participants blinded to treatment allocation?	X	√	X	X	X	X	X	X	X	X	X	X
3	Was allocation to treatment groups concealed from the allocator?	X	X	X	X	X	X	X	√	√	X	X	X
4	Were the outcomes of people who withdrew described and included in the analysis?	√	√	√	√	√	√	√	√	√	√	√	√
5	Were those assessing outcomes blind to the treatment allocation?	X	X	X	X	X	√	X	√	√	X	√	X
6	Were the control and treatment groups comparable at entry?	√	√	√	√	√	√	√	√	√	√	√	√
7	Were groups treated identically other than for the named interventions?	√	√	√	√	√	√	√	√	√	√	√	√
8	Were outcomes measured in the same way for all groups?	√	√	√	√	√	√	√	√	√	√	√	√
9	Were outcomes measured in a reliable way?	√	√	√	√	√	√	√	√	√	√	√	√
10	Was there adequate follow-up?	√	√	√	√	√	X	√	√	√	√	X	√
11	Was appropriate statistical analysis used?	√	√	√	√	√	√	√	√	√	√	√	√

Note. "√" = Yes; "X" = No.

(Cornman et al., 2008; Cosio, 2008; Illa et al., 2010; Margolin et al., 2003; Purcell et al., 2007). Another study of type 2 diabetes mellitus focused on promoting adherence to diabetes self-care behaviors such as consuming a healthy diet and engaging in physical activity (Osborn et al., 2010). A study designed for patients undergoing coronary artery bypass grafting encouraged adherence to self-care programs such as nutrition management, exercise regimens, smoking cessation, cardiac rehabilitation, stress management, and medication (Zarani, Besharat, Sadeghian, & Sarami, 2010). Finally, a study for women who received external-beam radiotherapy to treat cervical or endometrial cancer was designed to increase compliance with vaginal dilation (Jeffries, Robinson, Craighead, & Keats, 2006).

Strategies for integrating IMB model constructs in interventions

With regard to the information construct, behavioral interventions of four studies included information on the targeted chronic diseases and corresponding health behaviors (Jeffries et al., 2006; Osborn et al., 2010; Wagner et al., 2006; Zarani et al., 2010). For example, Osborn et al. included both diabetes prevalence and basic diabetes information and adherence-related knowledge in their intervention. All studies adopted the instruction strategy by using flip charts, short educational films, and handouts (Cosio, 2008; Osborn et al.; Purcell et al., 2007). In addition, various teaching techniques were used to deliver information, such as interactive discussion (Illa et al., 2010), counseling (Margolin et al., 2003), and peer teaching (Pearson, Micek et al., 2007).

For the motivation construct, most studies focused on increasing a positive attitude, a sense of social support, and perception of social norms (Cosio, 2008; Jeffries et al., 2006; Osborn et al., 2010; Parsons et al., 2007; Wagner et al., 2006; Zarani et al., 2010). Motivational interviewing techniques were used to enhance motivation (Cornman et al., 2008; Cosio; Osborn et al.; Parsons et al.; Zarani et al.). In addition, counseling by health care providers (Margolin et al., 2003; Sabin et al., 2010), group discussions (Illa et al., 2010; Jeffries et al.; Pearson, Micek et al., 2007), and social support groups (Pearson et al.; Wagner et al.) were used to increase motivation.

Regarding behavioral skills, the majority of reviewed studies concentrated on enhancing self-efficacy (Cosio, 2008; Jeffries et al., 2006; Osborn et al., 2010; Parsons et al., 2007; Pearson, Micek et al., 2007; Wagner et al., 2006) and teaching objective skills such as proper condom usage, how to quit smoking, and how to refuse alcoholic beverages (Cornman et al., 2008; Cosio; Illa et al., 2010; Jeffries et al.; Margolin et al., 2003; Osborn et al.; Parsons et al.; Pearson, Micek et al.; Purcell et al., 2007; Wagner et al.; Zarani et al., 2010). Other strategies included role playing (Margolin et al.; Osborn et al.), psychoeducational methods such as specific objective instruction by health care providers or peer mentors (Cosio; Jeffries et al.; Pearson, Micek et al.), and providing tailored modules or kits for the target disease (Margolin et al.; Parsons et al.; Purcell et al.).

Outcome variables and intervention effects

All 12 studies measured behavioral variables with self-report questionnaires. Ten reported significant behavior changes at the first post-intervention assessment (Cornman et al., 2008; Illa et al., 2010; Jeffries et al., 2006; Margolin et al., 2003; Osborn et al., 2010; Parsons et al., 2007; Pearson, Micek et al., 2007; Sabin et al., 2010; Wagner et al., 2006; Zarani et al., 2010). Among the six studies that were designed to improve HIV/AIDS medication adherence, five intervention groups showed significantly higher medication adherence than the control groups (Margolin et al.; Parsons et al.; Pearson, Micek et al.; Sabin et al.; Wagner et al.). Furthermore, three studies focusing on preventing risky sexual behaviors found that the groups treated with behavioral interventions based on the IMB model were less likely to engage in risky behaviors than untreated groups or those treated non-IMB behavioral interventions (Cornman et al.; Illa et al.; Margolin et al.). In patients with diabetes (Osborn et al.) and patients undergoing coronary artery bypass grafting (Zarani et al.), the intervention groups were more likely than the control groups to adhere to self-care behaviors.

Only 5 of the 12 reviewed studies measured biological variables such as CD4 cell counts/HIV viral load (Parsons et al., 2007; Pearson, Micek et al., 2007; Sabin et al., 2010; Wagner et al., 2006) or HbA1c levels (Osborn et al., 2010) in addition to gathering data with self-reported questionnaires. Two reported significant decreases in CD4 cell counts/HIV viral load (Parsons et al.) and HbA1c levels (Osborn et al.) in only the behavioral intervention groups.

The effects of intervention on behavior change persisted from immediately after to 12 months post-intervention. Duration varied according to length of intervention. For example, Osborn et al. (2010) and Zarani et al. (2010) designed one-shot behavioral interventions that produced behavior changes at 3 months post-intervention. Cornman et al. (2008) reported that a 6-month behavioral intervention had positive effects on behavior changes that persisted for 6 months post-intervention. Among studies that reported health behavior changes after the behavioral interventions, one study that delivered a behavioral intervention for 6 weeks showed that the behavior change persisted 12 months post-intervention (Pearson, Micek et al., 2007).

Discussion

This systematic review ascertained the applicability and effectiveness of interventions based on the IMB model for promoting behavioral changes among people with chronic diseases, with special attention to interventions focusing on risk prevention (e.g., proper condom use) and self-care behaviors (e.g., diabetes care, heart disease self-care). On the basis of the findings, we propose suggestions for future research and practice.

Strategies for implementing behavioral interventions based on the IMB model

We were able to discern the success of certain contents and strategies, and thus can suggest methods for developing future interventions. For the information construct, researchers and health care providers must consider providing both disease-specific and behavior-specific information. Instruction by using flip charts, short educational films, and handouts as well as teaching techniques such as interactive discussion and counseling can be used as intervention strategies. For the motivation construct, practitioners should utilize methods for increasing personal motivation such as developing a positive attitude and positive feelings regarding behavioral changes. Motivational interviewing techniques, which have been found to effectively foster changes across a wide range of health behaviors (Rollnick, Miller, & Butler, 2007), are useful for enhancing personal motivation. In addition, a variety of strategies, such as providing personal feedback and reflective listening, can be effectively combined with motivational interviewing, as reported by Zarani et al. (2010). For social motivation, researchers and health care providers must additionally consider modalities for developing a sense of social support and a perception of social norms. Strategies such as social support group participation can be used to enhance social motivation. For the behavior skills construct, both perceived self-efficacy and objective skills could be translated into behavioral interventions. Role playing, which can provide opportunities to learn skills hands-on and increase self efficacy (Osborn et al., 2010), would be a powerful strategy for fostering behavior skills. Other methods such as teach-

back, behavior games, memory blocking (for increasing memory skills), and skill-building modules should also be considered.

Outcome variables and intervention effects

Only five of the reviewed studies used both self-report and biological (objective) data. Although self-report data provided information about behavioral changes, it could be affected by respondents' emotions and memory. Thus, both behavioral and biological variables should be used to evaluate the effects of behavioral interventions. In our review, the effects of behavioral interventions on behavioral changes persisted up to 12 months post-intervention. This may have been because the follow-up periods ranged from immediately after to 12 months post-intervention. Follow-up periods after interventions should be long enough for accurate evaluation of the persistence of behavioral changes.

Transparent development process of behavioral interventions

Only three studies clearly delineated the three specific components of the IMB model within their intervention (Jeffries et al., 2006; Osborn et al., 2010; Zarani et al., 2010). Although the other studies reported that the IMB model was the theoretical framework for the interventions, they did not clearly convey the operationalization of each construct. It was therefore difficult to discern the role of the IMB model in intervention design. Future studies should provide more detailed descriptions of how the three IMB model constructs are operationalized and how the model is translated into behavioral interventions, using guidelines such as an intervention mapping approach (Bartholomew, Parcel, Kok, Gottlieb, & Fernandez, 2011).

Our research has certain limitations and biases. First, we could not analyze topics that were not covered in the studies, particularly concrete descriptions of the actual strategies used and experimental conditions of the studies. Second, nine of the reviewed studies were HIV-related. HIV/AIDS, like diabetes and heart disease, requires adherence to long-term therapies and self-management. The studies did not focus on the nature of HIV/AIDS as a disease, but rather on behavioral changes emphasized for the optimal care of patients (e.g., improving adherence and self-management or preventing risky behaviors). Third, this review did not include other nonintervention studies designed to validate and/or explore relationships among the three IMB model constructs by using descriptive survey methods even if they focused on chronic diseases such as diabetes (Fisher, Kohut, Schachner, & Stenger, 2011; Gao, Wang, Zhu, & Yu, 2013), heart failure (Kodiath, Kelly, & Shively, 2005), arthritis (Schoster, Callahan, Meier, Mielenz, & DiMartino, 2005), or other chronic medical conditions (Carpenter et al., 2010). Furthermore, we did not consider gray literature such as conference proceedings and government reports, leading to potential selection bias. Finally, one study (Sabin et al., 2010) used two constructs of the IMB model as interventions, whereas the remainder used all three. Although the study by Sabin et al. satisfied the selection criteria, it may have introduced bias.

Conclusion

Our systematic review suggests that the IMB model is a strong theoretical framework for developing behavioral interventions for patients with chronic diseases. However, evidence for the sustainability of behavior change remains necessary. The specific integration strategies delineated for each construct of the model can be utilized to design model-based interventions. Furthermore, although studies in this systematic review were designed for behavioral changes in patients with four types chronic diseases (i.e., HIV/AIDS, diabetes, heart diseases, and gynecologic cancer), behavioral interventions based on the IMB model could be applicable for patients with various chronic diseases such as asthma or epilepsy, who would benefit from adherence to self-care behaviors or prevention of risky behaviors.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgments

This work was supported by the National Research Foundation (NRF) of Korea grant funded by the Korea government (MEST; No. 2010-0022761).

References

Ammerman, A. S., Lindquist, C. H., Lohr, K. N., & Hersey, J. (2002). The efficacy of behavioral interventions to modify dietary fat and fruit and vegetable intake: A review of the evidence. *Preventive Medicine, 35*(1), 25–41. http://dx.doi.org/10.1006/pmed.2002.1028

Bartholomew, L. K., Parcel, G. S., Kok, G., Gottlieb, N. H., & Fernandez, M. E. (2011). *Planning health promotion programs: An intervention mapping approach*. San Francisco, CA: Jossey-Bass.

Carey, M. P., Maisto, S. A., Kalichman, S. C., Forsyth, A. D., Wright, E. M., & Johnson, B. T. (1997). Enhancing motivation to reduce the risk of HIV infection for economically disadvantaged urban women. *Journal of Consulting and Clinical Psychology, 65*(4), 531–541. http://dx.doi.org/10.1037/0022-006X.65.4.531

Carpenter, D. M., DeVellis, R. F., Fisher, E. B., DeVellis, B. M., Hogan, S. L., & Jordan, J. M. (2010). The effect of conflicting medication information and physician support on medication adherence for chronically ill patients. *Patient Education and Counseling, 81*(2), 169–176. http://dx.doi.org/10.1016/j.pec.2009.11.006

Centre for Reviews and Dissemination. (2008). *Systematic reviews: CRD's guidance for undertaking reviews in health care*. York, UK: Center for Reviews and Dissemination, University of York. Retrieved October 1, 2013, from http://www.york.ac.uk/inst/crd/index_guidance.htm

Cornman, D. H., Kiene, S. M., Christie, S., Fisher, W. A., Shuper, P. A., Pillay, S., et al. (2008). Clinic-based intervention reduces unprotected sexual behavior among HIV-infected patients in KwaZulu-Natal, South Africa: Results of a pilot study. *Journal of Acquired Immune Deficiency Syndromes, 48*(5), 553–560. http://dx.doi.org/10.1097/QAI.0b013e31817bebd7

Cosio, D. (2008). *A telephone-delivered, motivational interviewing intervention to reduce risky sexual behavior in HIV-infected rural persons: A pilot randomized clinical trial*. Unpublished dissertation. Athens, OH: Ohio University.

Deakin, T., McShane, C. E., Cade, J. E., & Williams, R. D. (2005). Group based training for self-management strategies in people with type 2 diabetes mellitus. *The Cochrane Database of Systematic Reviews*, (2), CD003417. http://dx.doi.org/10.1002/14651858.CD003417.pub2

Fisher, J. D., Fisher, W. A., & Shuper, P. A. (2009). The information-motivation-behavioral skills model of HIV prevention behavior. In R. J. DiClemente, R. A. Crosby, & M. C. Kegler (Eds.), *Emerging theories in health promotion practice and research* (pp. 21–63). San Francisco, CA: Jossey-Bass.

Fisher, J. D., & Fisher, W. A. (1992). Changing AIDS-risk behavior. *Psychological Bulletin, 111*(3), 455–474. http://dx.doi.org/10.1037/0033-2909.111.3.455

Fisher, J. D., Fisher, W. A., Amico, K. R., & Harman, J. J. (2006). An information-motivation-behavioral skills model of adherence to antiretroviral therapy. *Health Psychology, 25*(4), 462–473. http://dx.doi.org/10.1037/0278-6133.25.4.462

Fisher, W. A., Fisher, J. D., & Harman, J. (2003). The information-motivation-behavioral skill model: a general social psychological approach to understanding promoting health behavior. In J. Suls, & K. A. Wallston (Eds.), *Social psychological foundation of health and illness* (pp. 82–106). Malden, MA: Blackwell.

Fisher, W. A., Kohut, T., Schachner, H., & Stenger, P. (2011). Understanding self-monitoring of blood glucose among individuals with type 1 and type 2 diabetes: An information-motivation-behavioral skills analysis. *The Diabetes Educator, 37*(1), 85–94. http://dx.doi.org/10.1177/0145721710391479

Gao, J., Wang, J., Zhu, Y., & Yu, J. (2013). Validation of an information-motivation-behavioral skills model of self-care among Chinese adults with type 2 diabetes. *BMC Public Health, 13*, 100. http://dx.doi.org/10.1186/1471-2458-13-100

Illa, L., Echenique, M., Jean, G. S., Bustamante-Avellaneda, V., Metsch, L., Mendez-Mulet, L., et al. (2010). Project roadmap: reeducating older adults in maintaining AIDS prevention: A secondary intervention for older HIV-positive adults. *AIDS Education and Prevention, 22*(2), 138–147. http://dx.doi.org/10.1521/aeap.2010.22.2.138

Im, E. O., & Chang, S. J. (2012). A systematic integrated literature review of systematic integrated literature reviews in nursing. *Journal of Nursing Education, 51*(11), 632–640. http://dx.doi.org/10.3928/01484834-20120914-02

Jeffries, S. A., Robinson, J. W., Craighead, P. S., & Keats, M. R. (2006). An effective group psychoeducational intervention for improving compliance with vaginal dilation: a randomized controlled trial. *International Journal of Radiation Oncology, Biology, Physics, 65*(2), 404–411. http://dx.doi.org/10.1016/j.ijrobp.2005.12.009

Kim, S. Y., Park, H. J., Seo, H. J., Lee, Y. J., Jang, B. H., Son, H. J., et al. (2011). *NECA's guidance for undertaking systematic reviews and meta-analyses for intervention*. Seoul, Korea: National Evidence-based Healthcare Collaborating Agency.

Kodiath, M., Kelly, A., & Shively, M. (2005). Improving quality of life in patients with heart failure: an innovative behavioral intervention. *Journal of Cardiovascular Nursing, 20*(1), 43–48. http://dx.doi.org/10.1097/00005082-200501000-00009

Margolin, A., Avants, S. K., Warburton, L. A., Hawkins, K. A., & Shi, J. (2003). A randomized clinical trial of a manual-guided risk reduction intervention for HIV-positive injection drug users. *Health Psychology, 22*(2), 223–228. http://dx.doi.org/10.1037/0278-6133.22.2.223

Martin, L. R., Haskard-Zolneierek, K. B., & DiMatteo, M. R. (2010). *Health behavior change and treatment adherence: Evidence-based guidelines for improving healthcare*. New York: Oxford University Press.

Misovich, S. J., Martinez, T., Fisher, J. D., Bryan, A., & Catapano, N. (2003). Predicting breast self-examination: A test of the information-motivation-behavioral skills model. *Journal of Applied Social Psychology, 33*(4), 775–790. http://dx.doi.org/10.1111/j.1559-1816.2003.tb01924.x

Newman, S., Steed, E., & Mulligan, K. (2008). *Chronic physical illness: Self-management and behavioral interventions*. Maidenhead, UK: Open University Press.

Noar, S. M., Benac, C. N., & Harris, M. S. (2007). Does tailoring matter? Meta-analytic review of tailored print health behavior change interventions. *Psychological Bulletin, 133*(4), 673–693. http://dx.doi.org/10.1037/0033-2909.133.4.673

Norton, W. E. (2009). *Relative efficacy of a pregnancy, STI, or HV prevention-focused intervention on changing sexual risk behavior among young adults*. Unpublished doctoral dissertation. Storrs: University of Connecticut.

Osborn, C. Y. (2006). *Using the IMB model of health behavior change to promote self-management behavior in Puerto Ricans with diabetes*. Unpublished doctoral dissertation. Storrs: University of Connecticut.

Osborn, C. Y., Amico, K. R., Cruz, N., O'Connell, A. A., Perez-Escamilla, R., Kalichman, S. C., et al. (2010). A brief culturally tailored intervention for Puerto Ricans with type 2 diabetes. *Health Education and Behavior, 37*(6), 849–862. http://dx.doi.org/10.1177/1090198110366004

Parsons, J. T., Golub, S. A., Rosof, E., & Holder, C. (2007). Motivational interviewing and cognitive-behavioral intervention to improve HIV medication adherence among hazardous drinkers: A randomized controlled trial. *Journal of Acquired Immune Deficiency Syndromes, 46*(4), 443–450. http://dx.doi.org/10.1097/QAI.0b013e318158a461

Pearson, A., Field, J., & Jordan, Z. (2007). *Evidence-based clinical practice in nursing and health care: Assimilating research, experience and expertise*. Oxford, UK: Blackwell Publishing.

Pearson, C. R., Micek, M. A., Simoni, J. M., Hoff, P. D., Matediana, E., Martin, D. P., et al. (2007). Randomized control trial of peer-delivered, modified directly observed therapy for HAART in Mozambique. *Journal of Acquired Immune Deficiency Syndromes, 46*(2), 238–244. http://dx.doi.org/10.1097/QAI.0b013e318153f7ba

Purcell, D. W., Latka, M. H., Metsch, L. R., Latkin, C. A., Gomez, C. A., Mizuno, Y., et al. (2007). Results from a randomized controlled trial of a peer-mentoring intervention to reduce HIV transmission and increase access to care and adherence to HIV medications among HIV-seropositive injection drug users. *Journal of Acquired Immune Deficiency Syndromes, 46*(Suppl. 2), S35–S47. http://dx.doi.org/10.1097/QAI.0b013e31815767c4

Rollnick, S., Miller, W. R., & Butler, C. C. (2007). *Motivational interviewing in health care: Helping patients change behavior*. New York: The Guilford Press.

Sabaté, E. (2003). *Adherence to long-term therapies: Evidence for action*. Geneva, Switzerland: World Health Organization.

Sabin, L. L., DeSilva, M. B., Hamer, D. H., Xu, K., Zhang, J., Li, T., et al. (2010). Using electronic drug monitor feedback to improve adherence to antiretroviral therapy among HIV-positive patients in China. *AIDS and Behavior, 14*(3), 580–589. http://dx.doi.org/10.1007/s10461-009-9615-1

Schoster, B., Callahan, L. F., Meier, A., Mielenz, T., & DiMartino, L. (2005). The people with arthritis can exercise (PACE) program: a qualitative evaluation of participant satisfaction. *Preventing Chronic Disease, 2*(3), A11.

Shumaker, S. A., Ockene, J. K., & Rieker, K. A. (2009). *The handbook of health behavior change* (3rd ed.). New York: Springer.

Wagner, G. J., Kanouse, D. E., Golinelli, D., Miller, L. G., Daar, E. S., Witt, M. D., et al. (2006). Cognitive-behavioral intervention to enhance adherence to antiretroviral therapy: A randomized controlled trial (CCTG 578). *AIDS, 20*(9), 1295–1302. http://dx.doi.org/10.1097/01.aids.0000232238.28415.d2

Zarani, F., Besharat, M. A., Sadeghian, S., & Sarami, G. (2010). The effectiveness of the information-motivation-behavioral skills model in promoting adherence in CABG patients. *Journal of Health Psychology, 15*(6), 828–837. http://dx.doi.org/10.1177/1359105309357092