



# Evolution of the American College of Cardiology/American Heart Association Clinical Guidelines

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## ABSTRACT

**BACKGROUND** The American College of Cardiology (ACC) and the American Heart Association (AHA) have been developing clinical guidelines to assist practicing clinicians.

**OBJECTIVES** The goal of this study was to evaluate changes in ACC/AHA guideline recommendations between 2008 and 2014.

**METHODS** The previous and current ACC/AHA guideline documents that were updated between 2008 and June 2014 were compared to determine changes in Class of Recommendation (COR) and Level of Evidence (LOE). Each recommendation was classified as new, dropped, revised, or unchanged, and the changes in evidence were examined.

**RESULTS** During the study period, 11 guideline documents (9 disease based and 2 interventional procedure based) were updated. The total number of recommendations decreased from 2,067 to 1,869 (321 fewer recommendations in disease-based guidelines and 123 additional recommendations in interventional procedure-based guidelines). The recommendation class distribution of the updated guidelines was 50.1% Class I (previously 50.8%), 39.4% Class II (previously 35.4%), and 10.4% Class III (previously 13.8%) ( $p = 0.001$ ). The LOE distribution among updated versions was 15.0% for LOE: A (previously 13.3%), 50.8% for LOE: B (previously 41.4%), and 34.2% for LOE C (previously 45.3%) ( $p < 0.001$ ). Among all guidelines, 859 recommendations were new, 1,339 were dropped, 881 were unchanged in COR and LOE, and 129 were revised. Of the revised guidelines, 75 recommendations had an increase in LOE (the majority from LOE: C to LOE: B); 34 recommendations had a decrease in LOE; and 20 recommendations had class changes. LOE increases were justified by introduction of new randomized controlled trials, new studies, and new meta-analyses.

**CONCLUSIONS** The ACC/AHA guideline recommendations are undergoing significant changes, becoming more evidence based and scientifically robust with a tendency to exclude recommendations with insufficient scientific evidence. (J Am Coll Cardiol 2015;65:2726–34) © 2015 by the American College of Cardiology Foundation.

The American College of Cardiology (ACC) and the American Heart Association (AHA) have been creating clinical practice guidelines on cardiovascular disease since 1980 (1). These guidelines aim to improve the quality of care by critically assessing contemporary evidence to provide recommendations that can be used by clinicians for optimal care. Moreover, the clinical practice

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guidelines offer a benchmark that can be used to measure and compare quality of care and disease outcomes.

In 2009, Tricoci et al. (1) published a systematic review of the ACC/AHA guidelines and their evolution over time. They reported that the guidelines had “largely developed from lower levels of evidence or expert opinion” and that the “proportion of recommendations for which there was no conclusive evidence was growing.” Six years later, many guidelines have been updated. We performed a detailed analysis of the original and updated guidelines to determine the extent and types of interim changes.

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## METHODS

**SOURCE OF MATERIALS.** All ACC/AHA guidelines were downloaded from the ACC website on June 10, 2014, and guidelines that changed between 2008 and 2014 were identified. Both full guideline revisions and focused updates were included in the present analysis. The Level of Evidence (LOE) and Class of Recommendation (COR) classification were abstracted. The total number of recommendations within each recommendation class and the distribution of LOE designations across all recommendations were evaluated.

**COMPARISONS.** The most current guidelines were compared with those studied by Tricoci et al. (1) in 2009. Focused updates to guidelines were considered in the context of additional guidelines incorporated into the full guidelines. All guidelines were classified as disease based or interventional procedure based (there were no changes in diagnostic procedure-based guidelines between 2008 and 2014). For each guideline, the number of recommendations, as well as the COR and the LOE for each recommendation, were compared between the previous and the most current version. Each recommendation in the current guidelines was categorized as new, dropped, unchanged, or revised. Revised recommendations were further classified according to COR and LOE change. In addition, the reason for each change, such as new clinical data, was investigated.

The distribution of COR and LOE was compared by using the chi-square test with a Yates’ correction. A p value <0.05 was considered statistically significant. All analyses were performed by using JMP version 11.0 (SAS Institute, Inc., Cary, North Carolina).

## RESULTS

**GUIDELINE CHANGES.** Nine disease-based guidelines were analyzed: atrial fibrillation (2,3), heart failure (4,5), peripheral arterial disease (6,7), perioperative evaluation (8,9), secondary prevention (10,11), unstable angina and non-ST-segment elevation myocardial infarction (NSTEMI) (12,13), stable ischemic heart disease (14,15), valvular heart disease (16,17), and ST-segment elevation myocardial infarction (STEMI) (18,19). In addition, 2 interventional procedure-based guidelines were assessed: percutaneous coronary intervention (PCI) (20,21) and coronary artery bypass graft (CABG) (22,23) (Table 1, Figure 1).

The time interval between publication of the previous and the current updated version of each guideline was  $6.5 \pm 2.5$  years for the disease-based guidelines and  $6.5 \pm 0.7$  years for the interventional procedure-based guidelines. Author retention varied widely among the various guideline updates, from 0% (PCI guidelines) to 80% (perioperative evaluation guidelines).

**NUMBER OF RECOMMENDATIONS.** Overall, the total number of recommendations decreased from 2,067 to 1,869 (Table 2). The recommendations included in the 9 disease-based guidelines decreased by 321 (from 1,847 to 1,526) (Figure 1), whereas those included in the 2 interventional procedure-based guidelines increased by 123 (from 220 to 353). The number of recommendations increased in the updated versions of the following guidelines: atrial fibrillation, heart failure, peripheral arterial disease, perioperative evaluation, secondary prevention, unstable angina

## ABBREVIATIONS AND ACRONYMS

- ACC** = American College of Cardiology
- AHA** = American Heart Association
- CABG** = coronary artery bypass graft
- COR** = Class of Recommendation
- LOE** = Level of Evidence
- NSTEMI** = non-ST-segment elevation myocardial infarction
- PCI** = percutaneous coronary intervention
- STEMI** = ST-segment elevation myocardial infarction

**TABLE 1** Year of Publication of the Previous and the Most Up-To-Date Clinical Guidelines Included in the Present Study

	Previous (Year)	Updated (Year)	Type of Update
Atrial fibrillation (2,3)	2006	2014	Full
Heart failure (4,5)	2005	2013	Full
Stable ischemic heart disease (14,15)	2002	2012	Full
Valvular heart disease (16,17)	2008	2014	Full
STEMI (18,19)	2004	2013	Full
PCI (20,21)	2005	2011	Full
CABG (22,23)	2004	2011	Full
Peripheral arterial disease (6,7)	2005	2011	Focused
Perioperative evaluation (8,9)	2007	2009	Focused
Secondary prevention (10,11)	2006	2011	Focused
Unstable angina/NSTEMI (12,13)	2007	2012	Focused

CABG = coronary artery bypass graft; NSTEMI = non-ST-segment elevation myocardial infarction; PCI = percutaneous coronary intervention; STEMI = ST-segment elevation myocardial infarction.

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