Synthesizing Lessons Learned From Get With The Guidelines
The Value of Disease-Based Registries in Improving Quality and Outcomes

A. Gray Ellrodt, MD, Chair; Gregg C. Fonarow, MD, FAHA, Co-Chair;
Lee H. Schwamm, MD, FAHA, Co-Chair;
Nancy Albert, PhD, CCNS, CHFN, CCRN, NE-BC, FAHA;
Deepak L. Bhatt, MD, MPH, FAHA; Christopher P. Cannon, MD;
Adrian F. Hernandez, MD, MHS; Mark A. Hlatky, MD; Russell V. Luepker, MD, MS;
Pamela N. Peterson, MD, MSPH; Mathew Reeves, BVSc, PhD;
Eric Edward Smith, MD, MPH, FRCPC, FAHA

The American Heart Association/American Stroke Association (AHA/ASA) is a trusted source of scientific information in cardiovascular medicine. The AHA/ASA has a long-standing commitment to support state-of-the-art scientific research in cardiovascular disease and stroke. The AHA/ASA has also developed a leadership role in translating cardiovascular science into internationally respected guidelines. In 2000, however, the AHA/ASA concluded that, to provide maximal benefit for patients with cardiovascular disease and those at risk, it needed to develop a rigorous approach to translating its guidelines into clinical practice. The result was a comprehensive suite of programs collectively called Get With The Guidelines (GWTG). Modeled in part on the University of California, Los Angeles Cardiovascular Hospitalization Atherosclerotic Management Program (CHAMP),1,2 GWTG was successfully piloted by the AHA in Massachusetts.3 Based on the success of the Massachusetts pilot, the AHA committed significant human and financial resources to extend the program across the United States. This commitment included the development of a national steering committee composed of AHA/ASA volunteers, and the addition of multiple modules including hospital-based management of coronary artery disease, heart failure, stroke, and resuscitation after in-hospital cardiac arrest. The scientific foundation of the program is the best evidence from the latest American College of Cardiology/AHA/ASA guidelines. GWTG staff work with participating hospitals to implement these guidelines by using AHA/ASA quality improvement professional consultation, workshops, and Webinars. In addition, the AHA developed sophisticated clinical databases (registries) through which hospitals and physicians collect information in real time for the assessment of quality, regional, and national benchmarking, national recognition, and the generation of new science. The AHA underwrites a portion of the costs associated with the technology platform and data collection tools to reduce the financial burden on participating sites.

From the 4 GWTG disease-specific registries, >200 articles have been published in peer-reviewed journals. This statement will distill the information from those articles into a concise review of particular use to policy makers throughout the country and world. The scope and impact of GWTG program is profound. Of the 6280 hospitals registered with the American Hospital Association, 1956 US hospitals participate in at least 1 GWTG program (31%).4 Many institutions use ≥2 modules (Figure 1). These hospitals have submitted almost 5 million patient records since the inception of GWTG, with >2 million patients in the Stroke registry alone (Figure 2). In certain diseases, such as stroke, GWTG now enrolls >40% of all index hospitalizations in the United States annually (Figure 2).

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

This statement was approved by the American Heart Association Advocacy Coordinating Committee on August 9, 2013. A copy of the document is available at http://my.americanheart.org/statements by selecting either the “By Topic” link or the “By Publication Date” link. To purchase additional reprints, call 843-216-2533 or e-mail kelle.ramsay@wolterskluwer.com.


The online-only Data Supplement is available with this article at http://circ.ahajournals.org/lookup/suppl/doi:10.1161/01.cir.0000435779.48007.5c/-DC1.

Expert peer review of AHA Scientific Statements is conducted by the AHA Office of Science Operations. For more on AHA statements and guidelines development, visit http://my.americanheart.org/statements and select the “Policies and Development” link.

Permissions: Multiple copies, modification, alteration, enhancement, and/or distribution of this document are not permitted without the express permission of the American Heart Association. Instructions for obtaining permission are located at http://www.heart.org/HEARTORG/General/Copyright-Permission-Guidelines_UCM_300404_Article.jsp. A link to the “Copyright Permissions Request Form” appears on the right side of the page.

(Circulation. 2013;128:2447-2460.)
© 2013 American Heart Association, Inc.

Circulation is available at http://circ.ahajournals.org

DOI: 10.1161/01.cir.0000435779.48007.5c

2447
This statement will also highlight lessons learned from GWTG and elucidate their policy implications in 4 distinct sections. The first section presents an overview of the GWTG program and evidence that the GWTG performance improvement system can be implemented nationally and is associated with a substantial improvement in quality of care over a broad range of cardiovascular conditions in multiple settings. The second section addresses the power of assembling GWTG data to (a) generate new knowledge, (b) identify areas for future quality improvement efforts and measures, (c) drive measure prioritization and construct, (d) improve the development of measures, guidelines, and implementation strategies to reduce racial and sex disparities, and (e) determine the safety and effectiveness of therapies applied in routine practice. The third section presents evidence that GWTG has made a contribution to increasing the value of health care for our hospitals, payers, and our patients. We specifically explore reductions in length of stay and readmission rates and improvements in patient safety. In the fourth section, we address how the linkage of the GWTG clinical database with administrative data (eg, Medicare fee-for-service claims data) fosters real-world clinical effectiveness research (CER) and can be used to assess current practice, identify focused areas of health disparities, and develop successful implementation strategies to address opportunities to improve care. The final 2 sections address the limitations of GWTG and summarize policy recommendations.

**National Implementation and Impact on Quality of Care**

There are substantial gaps in quality of care for cardiovascular disease, including disparities by sex, race/ethnicity, and geographic region.5 The GWTG program was launched to improve in-hospital quality of care and reduce disparities by providing a platform for hospitals to review their own data with hospital-selected regional and national benchmarks. The program provides clinical decision support tools, Webinars, conferences focused on quality improvement, and other educational materials. In addition, the program provides expert AHA field staff to assist providers in developing sophisticated quality improvement programs.3,6 For more detail on the scope of activities in the GWTG program readers are referred to references 3, 6, and 7. In addition to the significant commitment of resources by the AHA/ASA, hospitals must commit quality improvement professionals and data abstraction capabilities to be successful. By also facilitating real-time hospital and individual physician access to benchmarked performance data, providers can compare their performance against other hospitals based on a large selection of variables. These include benchmarking against all GWTG hospitals, hospital systems, and individual hospitals participating.
geographic regions, hospital teaching status, bed size, and a variety of other hospital characteristics.

GWTG uses chart abstraction of clinical data elements into a Web-based platform provided by Outcome: A Quintiles Company (Cambridge, MA). Case ascertainment is either concurrent with the use of clinical criteria or retrospective based on coding. Process measures are divided into achievement (performance) measures and quality measures. Achievement measures have the strongest supporting evidence and strongest link between the process and health outcomes. Most of these measures are endorsed by the National Quality Forum (NQF). These measures drive the GWTG Performance Achievement Award program and are shown in Tables 1, 2, and 3. Quality measures are supported by strong evidence, but not as robust as that supporting achievement measures. These quality measures are important future candidates for achievement measures, and extend the scope of interventions available to already high-performing hospitals. Finally, these quality measures can support recent changes to the NQF endorsement process requiring previous field testing of candidate performance measures.

Measures are developed by physician volunteers and AHA staff and are harmonized with measures developed by the American College of Cardiology/AHA, US Department of Health and Human Services, and The Joint Commission and those already endorsed by the NQF. For each measure, hospitals report the proportion of eligible patients receiving the intervention divided by the total number of patients eligible for the measure without explicit documented contraindications. A performance achievement award program with public recognition is designed to provide further incentives to participating hospitals. Tiered award levels are based on the number of quarters or years of consistent performance at a level of at least 85% adherence for all achievement measures, with additional opportunities for distinction in the quality measures domain.

Although GWTG is a voluntary program, participation has grown remarkably in each disease module since program inception (Figures 1 and 2). The high uptake of GWTG within the stroke community is likely driven by recommendations from the Brain Attack Coalition and ASA that primary stroke centers should engage in ongoing continuous quality improvement, and by the proliferation of state regulations or

| Table 1. Time Trends in GWTG-ACS Quality-of-Care Measures, 2006–2011 |
|------------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Quality of Care Measure | 2006* | 2007* | 2008* | 2009 | 2010* | 2011* |
| Aspirin within 24 h of admission | 94.7 | 92.8 | 91.2 | 90.9 | 97 | 97.6 |
| Aspirin at discharge | 94.4 | 95.8 | 94.9 | 95.5 | 98 | 98.3 |
| β-Blockers at discharge | 92.8 | 94.6 | 94.5 | 94.9 | 96 | 96.7 |
| Lipid-lowering medication at discharge | 84.5 | 85.6 | 81.6 | 86.8 | 92† | 98.4† |
| Lipid therapy at discharge if LDL cholesterol >100 mg/dL | 89.1 | 90.7 | 91.9 | 92.5 | NM | NM |
| ARB/ACEI at discharge for patients with LVEF <40% | 87.3 | 91.1 | 91.9 | 91.9 | 86 | 87.8 |
| Adult smoking cessation advice/counseling | 94.3 | 97.4 | 98.4 | 98.4 | 98 | 98.4 |
| Cardiac rehabilitation referral for AMI patients | 71.1 | 63.6 | 52.0 | 49.1 | 75 | 76.5 |

Values are percentages. AMI indicates acute myocardial infarction; ARB/ACEI, angiotensin receptor blocker/angiotensin-converting enzyme inhibitor; GWTG-ACS, Get With The Guidelines—Acute Coronary Syndrome; LDL, low-density lipoprotein; LVEF, left ventricular ejection fraction; and NM, not measured.

*The American Heart Association (AHA) GWTG-Coronary Artery Disease (CAD) registry was merged into the Acute Coronary Treatment and Intervention Outcomes Registry (ACTION) registry. Therefore, measures from 2006–2009 are from the AHA’s GWTG-CAD registry. 2010/2011 measures are from the ACTION registry.
†Represents statin use.

Reproduced with permission from Go et al. Copyright © 2012, American Heart Association, Inc.

| Table 2. Time Trends in GWTG-HF Quality-of-Care Measures, 2006–2011 |
|------------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Quality of Care Measure | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| LVEF assessment* | 93.8 | 96.2 | 96.8 | 98.2 | 98 | 99.2 |
| ARB/ACEI at discharge for patients with LVSD* | 85.5 | 89.1 | 91.6 | 93.0 | 94.2 | 95.4 |
| Complete discharge instructions† | 78.8 | 84.8 | 88.5 | 90.9 | 93.3 | 93.5 |
| Postdischarge appointment (new for 2011)* | — | — | — | — | — | 13.3 |
| Adult smoking cessation advice/counseling† | 90.8 | 94.7 | 97.1 | 97.6 | 99.3 | 99.2 |
| β-Blockers at discharge for patients with LVSD, no contraindications† | 89.9 | 90.2 | 92.5 | 92.7 | 94.8 | 96.2 |
| Evidence-based specific β-blockers* | 67.7 | 58.9 | 54.1 | 45.2 | 48.4 | 58.4 |
| Anticoagulation for atrial fibrillation or atrial flutter, no contraindications | 62.9 | 61.6 | 60.7 | 68.9 | 70.2 | 75.4 |

Values are percentages. ARB/ACEI indicates angiotensin receptor blocker/angiotensin-converting enzyme inhibitor; GWTG-HF, Get With The Guidelines—Heart Failure; LVEF, left ventricular ejection fraction; and LVSD, left ventricular systolic dysfunction.

*Indicates the 4 key achievement measures targeted in GWTG-HF.
†Indicates historical key achievement measures in GWTG-HF.

Reproduced with permission from Go et al. Copyright © 2012, American Heart Association, Inc.
Table 3. Time Trends in GWTG-Stroke Quality-of-Care Measures, 2006–2011

<table>
<thead>
<tr>
<th>Quality of Care Measure (%)</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV tPA in patients who arrived ≤2 h after symptom onset, treated ≤3 h *</td>
<td>55.8</td>
<td>60.2</td>
<td>63.9</td>
<td>73.1</td>
<td>76.2</td>
<td>78.3</td>
</tr>
<tr>
<td>IV tPA in patients who arrived &lt;3.5 h after symptom onset, treated ≤4.5 h †</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>42.5</td>
<td>57.9</td>
</tr>
<tr>
<td>IV tPA Door-to-Needle Time ≤60 min</td>
<td>22.5</td>
<td>24.9</td>
<td>25.9</td>
<td>28.0</td>
<td>29.5</td>
<td>33.8</td>
</tr>
<tr>
<td>Thrombolytic complications: IV tPA and life-threatening, serious systemic hemorrhage</td>
<td>20.8</td>
<td>17.3</td>
<td>16.1</td>
<td>15.1</td>
<td>13.1</td>
<td>15.7</td>
</tr>
<tr>
<td>Antithrombotics &lt;48 h after admission *</td>
<td>94.8</td>
<td>95.8</td>
<td>96.0</td>
<td>96.2</td>
<td>96.3</td>
<td>96.7</td>
</tr>
<tr>
<td>DVT prophylaxis by second hospital day *</td>
<td>85.3</td>
<td>88.9</td>
<td>92.2</td>
<td>92.7</td>
<td>92.2</td>
<td>93.5</td>
</tr>
<tr>
<td>Antithrombotics at discharge *</td>
<td>94.1</td>
<td>95.1</td>
<td>97.0</td>
<td>97.8</td>
<td>97.7</td>
<td>98.1</td>
</tr>
<tr>
<td>Anticoagulation for atrial fibrillation at discharge *</td>
<td>88.2</td>
<td>89.5</td>
<td>93.1</td>
<td>93.5</td>
<td>93.5</td>
<td>93.1</td>
</tr>
<tr>
<td>Therapy at discharge if LDL cholesterol &gt;100 mg/dL or LDL cholesterol not measured or on therapy at admitt</td>
<td>70.3</td>
<td>76.3</td>
<td>82.1</td>
<td>86.2</td>
<td>88.1</td>
<td>89.8</td>
</tr>
<tr>
<td>Counseling for smoking cessation *</td>
<td>86.1</td>
<td>92.2</td>
<td>94.3</td>
<td>96.2</td>
<td>96.7</td>
<td>97.0</td>
</tr>
<tr>
<td>Lifestyle changes recommended for BMI &gt;25 kg/m²</td>
<td>42.5</td>
<td>45.7</td>
<td>51.7</td>
<td>57.3</td>
<td>57.8</td>
<td>57.8</td>
</tr>
<tr>
<td>Composite quality of care measure</td>
<td>85.9</td>
<td>88.9</td>
<td>91.7</td>
<td>93.3</td>
<td>93.7</td>
<td>94.4</td>
</tr>
</tbody>
</table>

Values are percentages.

*Indicates the 7 key achievement measures targeted in GWTG-Stroke.

Reproduced with permission from Go et al.10 © Copyright 2012, American Heart Association, Inc.
with significant improvements in multiple processes of care strongly linked to improved outcomes.\textsuperscript{15,16} These improvements are summarized in Tables 1, 2, and 3. These changes have been rapid and sustained over many years. In addition, GWTG has produced multiple specific improvements in guideline adherence documented in the specific sections that follow.

**Facilitate Synthesis of Data to Better Understand Practice Patterns and Disease States**

**Generate New Knowledge and Understanding**

Information about healthcare trends and outcomes are critical to our understanding of and improvement in the treatment and prevention of acute and chronic diseases.\textsuperscript{17} The GWTG program is designed to improve the care of individual patients and to facilitate the rapid evaluation of current practices at the provider, clinic, hospital, and regional level.

Through its ongoing real-world surveillance function, GWTG can serve as a data source for agencies that track and report disease incidence and burden.\textsuperscript{18} Many recognize that research and its synthesis into guidelines do not have the same results or outcomes in real-world practice. This may be because research results are not applied in the same way as in a trial, diffuse slowly through the medical community, or are not applied at all.\textsuperscript{19} Surveillance of practice allows the characterization of these changes over time, the opportunity to accelerate improvement and demonstrate differences between practitioners and geographically diffuse healthcare institutions.

Disparities in cardiovascular health and health care in the United States are well documented in the 2003 Institute of Medicine report, *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*.\textsuperscript{20} These inequalities continue and include differences by sex, education level, income, insurance, and geographic location.\textsuperscript{21} For example, a recent review found that blacks were less likely to be admitted to a coronary care unit, spent less time in the unit, and were likely to be discharged after a shorter hospital stay.\textsuperscript{22}

GWTG studies have shown both reductions in and elimination of disparities in the delivery of hospital-based cardiovascular and stroke care. In each case, new knowledge emerged from the GWTG analyses, and valuable lessons learned paved the way for new GWTG strategies to reduce health disparities elsewhere. For example, GWTG researchers reported substantial underuse of implantable cardiac defibrillators (ICDs) in eligible women and black patients in comparison with white male patients with systolic heart failure.\textsuperscript{23} The program then focused educational efforts in workshops and Webinars on the importance of ICD placement in eligible patients.\textsuperscript{24} From 2005 to 2009 in GWTG-Heart Failure–participating hospitals, the authors observed a significant increase in ICD therapy use in all sex and race groups, eliminating the observed disparities.\textsuperscript{24} In hospitals participating in GWTG-Stroke there were substantial improvements in acute ischemic stroke care demonstrated over time in all race/ethnic groups (Figure 3).\textsuperscript{25}

The GWTG platform is also a valuable tool in tracking the rate of diffusion of new knowledge and the adoption of new guideline recommendations. GWTG researchers demonstrated that the proportion of eligible patients with acute ischemic stroke treated with intravenous tissue-type plasminogen activator (tPA) within 4.5 hours of onset increased rapidly and substantially after publication of study results and an ASA advisory.\textsuperscript{26} GWTG was able to facilitate rapid adoption, track the rate of adoption, and identify areas for further improvement.

Finally, the GWTG program has engaged young investigators in the examination of registry information, generation of new ideas, and publication of articles that have not only contributed to new knowledge and understanding, but also have helped launch young investigator careers. To date, the program has awarded 41 young investigator awards.

**Essential for Identifying Areas for Future Quality Improvement Efforts/Measures**

Data generated by the GWTG program are essential for identifying areas for future quality improvement efforts and measures.
quality measurement. Analyses of GWTG data have identified gaps in evidence-based care. With awareness of such gaps, quality measures can be highlighted and adherence subsequently tracked over time. This iterative process makes the GWTG registries dynamic—they not only report data, but they facilitate quality improvement by providing feedback to sites about their individual performance in comparison with aggregate data.

As noted, registry data provide real-world information about how patients are actually being treated in a way that randomized clinical trials cannot. For example, GWTG-Heart Failure demonstrated dramatic underuse of aldosterone antagonists despite randomized clinical trial data supporting their use. Only one third of eligible patients without any documented contraindications were prescribed aldosterone antagonists on discharge. By incorporating aldosterone antagonist prescription in appropriate patients into Target: Heart Failure, an extension of GWTG, this and other clinical opportunities can be addressed and performance improved.

Despite compelling evidence and national guidelines, a pivotal GWTG report identified immense hospital variation in the percentage of ischemic stroke patients who received their thrombolytic dose within 60 minutes of hospital arrival. Based on these data, GWTG-Stroke has implemented Target: Stroke, a national quality improvement initiative to reduce door-to-needle time in intravenous tPA use through the use of 10 key evidence-based strategies. The Target: Stroke program is now assessing the ability of the 1200 participating hospitals to achieve the 60-minute door-to–tPA target in 50% of patients.

**Drive Prioritization of Measures, Identify/Test New Measures, and Determine Measure Construct**

The AHA/ASA and GWTG have helped convene key stakeholders to promote harmonization and definition of evidence-based measures with strong process outcome links. Data from GWTG have been invaluable in updating American College of Cardiology Foundation/AHA performance measure sets for acute myocardial infarction and for heart failure. In addition, the AHA/ASA helped convene stakeholders to identify and prioritize measures forming the basis of stroke quality improvement over the next decade. Over the past decade, various healthcare accreditation and quality improvement organizations in the United States have become actively involved in improving the quality of care for stroke patients. These early efforts centered on the development and standardization of achievement measures designed to measure specific aspects of the structure, process, and outcomes of acute stroke care. Most of these measures were developed based on the recommendations of evidence-based clinical guidelines, and the benchmarks proposed by the Brain Attack Coalition for the establishment of primary stroke centers, as well. In 2003, the Stroke Performance Measure Consensus Group—a collaboration between the AHA/ASA, The Joint Commission, and Centers for Disease Control and Prevention—began the essential process of harmonizing definitions and abstraction rules for stroke performance measures. The consensus process resulted in 10 harmonized acute hospital care stroke performance measures. Eight of the 10 measures were subsequently endorsed by the NQF, which acts as an independent authority and clearinghouse for the establishment of quality-related measures. Centers for Medicare & Medicaid Services (CMS) will likely include the 8 NQF-endorsed stroke measures as part of its core measure pay-for-reporting initiative beginning with inpatient discharges in fiscal year 2015. These publicly reported performance measures will be available to consumers on the CMS Hospital Compare Web site. Additionally, physician-level stroke performance measures have been endorsed by the NQF for use in the CMS Physician Quality Reporting Initiative program, an incentive pay-for-reporting program.

The GWTG-Stroke Program has played an essential role in the development and tracking of these stroke performance measures; data from the GWTG-Stroke registry, as well as other stroke quality improvement initiatives, have served to illustrate the importance of ongoing and systematic data collection. For example, analysis of >320000 ischemic stroke patients treated at 800 GWTG-Stroke hospitals between 2003 and 2008 found clinically meaningful improvements in all 7 measures examined with absolute increases ranging from 3.2% to 30.7%. Based on the strength of the GWTG program, and its reputation for reliable data collection, several states now use GWTG as a required component for state stroke center designation, and the vast majority of the states participating in the Centers for Disease Control and Prevention’s Paul Coverdell National Acute Stroke Registry also use GWTG as their data entry and quality improvement vehicle. These public–private partnerships are another critical example of how collaboration helps to identify and refine appropriate measures and ensure effective and broad implementation.

**Improve Development of Process of Care Measures, Guidelines, and Their Implementation**

The GWTG program and database include processes of care measures that inform clinicians about practice patterns, the level of equitable care, and adherence to clinical practice guidelines, and facilitate clinical quality improvement. In 1 report of Medicare patients, hospitals enrolled in the GWTG-Heart Failure registry demonstrated better processes of care than other hospitals and had lower 30-day readmission rates. In specific patient populations, including women, Hispanics, and Asian Americans, a decrease or elimination of sex and race/ethnic disparities was observed. GWTG researchers found that lower-risk patients were referred more often to disease management programs and that quality and performance measures were higher in those referred. Such data could be used to optimize the selection of patients for referral. In patients with acute coronary syndromes, learning that intensive lipid-lowering therapy was not prescribed at hospital discharge for most eligible patients provides evidence that greater attention is needed in the implementation of guideline-recommended intensive statin therapy.

**Determine the Safety and Effectiveness of Therapies as Applied in Routine Practice Rather Than The Highly Monitored Setting of Controlled Trials**

Randomized controlled trials are highly monitored for safety and for delivery of therapy, are typically conducted in...
specialized practice settings, and include patient populations that may not be representative of the entire population with the disease.

A recent GWTG study showed that intravenous tPA for ischemic stroke is safe, without increased risk of intracranial hemorrhage, in patients taking warfarin with a subtherapeutic international normalized ratio of ≤1.7.46 This study of 23,437 patients treated with tPA, of whom 1802 were taking warfarin, provides compelling evidence that patients on subtherapeutic warfarin should indeed be treated with tPA, as has been recommended by AHA guidelines and US Food and Drug Administration package labeling for years, despite no controlled trial evidence that this strategy is safe.

### GWTG’s Contribution to Increasing the Value of Health Care

Achieving high value is an overarching goal of healthcare delivery. The simple equation, Value = Quality (Outcomes)/Cost, can guide discussion, prioritization, and program development. GWTG has improved value by identification of critical gaps in care,28,47,49 fostering targeted quality improvement interventions to close those gaps, measuring the rate and degree of change and facilitating development of new quality measures.

The GWTG program is associated with improved efficiency of care and thus lower costs through decreases in hospital length of stay.44,50 In addition, GWTG hospitals demonstrate decreases in 30-day readmission rate in comparison with non-GWTG hospitals.42 Finally, linkage to CMS cost data, as discussed below, has significant potential to demonstrate improved efficiency and effectiveness across the continuum. This may be driven in part by the increased use of evidence-based secondary preventive measures.

GWTG also helps to facilitate safe medical care. The GWTG program not only helps to ensure that eligible patients receive effective therapies, but also helps identify patients who do not qualify or are inappropriate for certain therapies. For example, aldosterone antagonists can improve clinical outcomes among patients with heart failure, but they have a definite risk of adverse effects, particularly in certain patient populations. Although some studies have demonstrated a high rate of inappropriate use of these aldosterone antagonists, the rate of inappropriate use among GWTG participants has been very low.28,29

### Linkage to Administrative Data Fosters Real-World Clinical Effectiveness Research

To improve cardiovascular quality of care and outcomes, evidence regarding the clinical and comparative effectiveness of therapies, especially in patient populations underrepresented in clinical trials, is needed. It is often difficult to extrapolate clinical trial results to populations that have not been evaluated. In addition, there is often a lack of information regarding the relative risks and benefits of alternative therapies. To address these important gaps, several initiatives have been developed to prioritize and accelerate CER. For example, the American Recovery and Reinvestment Act of 2009 allocated $1.1 billion for CER,51 and the Patient Protection and Affordable Care Act of 2010 created the Patient-Centered Outcomes Research Institute.51a

Unfortunately, a robust infrastructure is lacking for conducting multiple comparative trials efficiently and economically. Clinical trials are resource intensive. Although observational clinical data can be used for CER, there is often limited detailed clinical information beyond the in-hospital setting, and the United States lacks a national, integrated healthcare record to facilitate CER across the continuum.

GWTG has led an ambitious effort to link registry data with administrative claims to conduct CER and outcomes research. GWTG registries contain rich clinical details on patient characteristics, inpatient care, discharge therapies, and eligibility criteria for guideline-recommended therapies. Unfortunately, clinical follow-up is beyond the available resources for a voluntary registry and would require patient identifiers and informed consent that would likely limit enrollment.

Administrative data have traditionally been used to understand temporal changes or national patterns of outcomes such as readmission or mortality. Medicare claims are available for all Medicare fee-for-service patients and contain patient identifiers to link patient records across time to provide a continuous record of hospitalizations, outpatient care, outcomes, and now drug therapy, with the use of Part D pharmacy benefits. These databases do have important information on mortality and subsequent healthcare resource use, but they do not have detailed clinical data and therefore have limits for addressing priorities identified for CER. By linking hospitalization records from Medicare claims with GWTG clinical registries, an inpatient episode with longitudinal follow-up can be used to conduct CER.

The main methods used for linking GWTG registry data to Medicare claims take advantage of the uniqueness of combining several indirect identifiers.52 The GWTG registries do not have unique patient identifiers such as patient names or social security numbers. However, with the use of nonunique fields such as admission date, discharge date, site, and patient age, the combination of these indirect identifiers yields a set of unique patient records that can be matched to Medicare claims from a hospitalization without risk of personal reidentification in the aggregated data set. The high level of uniqueness facilitates linking without knowing any patient identifiers and has been externally validated. The regulatory and ethical considerations have been examined thoroughly to ensure that these linked data sets are used without risk to patient privacy.51

GWTG already has substantial experience linking to Medicare claims. The predecessor to GWTG-Heart Failure was the first cardiovascular registry linked to Medicare claims.54 A subsequent study examined the clinical effectiveness of β-blocker therapy in Medicare beneficiaries to demonstrate lower mortality and readmission rates among older patients previously underrepresented in clinical trials.55 The use of ICDs in older patients has been controversial because of the low numbers of patients in the pivotal trials. The GWTG-Heart Failure registry linked with Medicare claims was among the first to address this important question by studying 4685 patients who were eligible for an ICD at discharge.56 In contrast to the clinical trials, the mean age was 75.2 years, and 60% of the patients were women with a mean ejection fraction...
of 25%. Among the 376 (8.0%) patients who received an ICD before discharge, mortality was significantly lower in comparison with those who did not (19.8% versus 27.6% at 1 year, 30.9% versus 41.9% at 2 years, and 38.1% versus 52.3% at 3 years; *P*<0.001 for all comparisons).

In a study with important policy and comparative effectiveness implications, investigators used the GWTG-Heart Failure registry to examine early follow-up after discharge. In this study, patients discharged from hospitals with the lowest early follow-up rate had the highest 30-day readmission rate. These data have subsequently been used to promote efforts to have heart failure patients follow-up shortly after discharge.

In a GWTG-Stroke study, use of the National Institutes of Health Stroke Scale was shown to substantially improve prognostic information regarding 30-day mortality risk in Medicare beneficiaries with acute ischemic stroke. Because stroke severity information such as the National Institutes of Health Stroke Scale is currently available only by chart review and is not coded in administrative data, the implication of this research is that ischemic stroke mortality risk adjustment models based on Medicare administrative data alone will not adequately adjust for variation in stroke severity across hospitals. Therefore, this study has important implications for internal use in hospitals and profiling hospitals nationally, as well as risk adjustment for comparative effectiveness research.

With this extensive experience, the GWTG programs are well positioned for serving as a national surveillance network to evaluate the effectiveness of cardiovascular therapies in the real world. Several important studies are in progress, including evaluation of the effectiveness of aldosterone antagonist therapy and cardiac resynchronization therapy in heart failure patients with reduced ejection fraction. The effectiveness of warfarin therapy will be examined in patients with atrial fibrillation and heart failure. In stroke care, the time to reperfusion and the effectiveness of secondary prevention may also be examined. As new therapies emerge, such as the novel anticoagulants and new reperfusion therapies for stroke and myocardial infarction, effectiveness and safety in the real world can be established by using GWTG registries linked to Medicare claims.

In addition, linking GWTG registries to other claims data may provide a more comprehensive picture of care. There is significant complementary potential of linkage of GWTG clinical registries to commercial insurance claims data with information on younger patients. Finally, linkage to The Guideline Advantage Program, which focuses on outpatient care, may prove very useful in promoting CER.

**Limitations of GWTG**

Although there are many contributions GWTG can make to inform policy, there are several limitations that deserve mention. GWTG is not a randomized trial and has no matched control group, and thus, as all observational studies, has limitations. The program is voluntary, and although sites are instructed to enter all patients consecutively whether identified by concurrent review or at coding, it is possible that not all patients are included. Nevertheless, the observation that the GWTG Medicare stroke population was highly representative of the CMS population when those 2 databases were linked suggests that a representative sample is included. It is also possible that data are incomplete and adjudication has not been formalized in the program. Data accuracy has been formally assessed in a sample of stroke patients but not in the other modules, and thus, inaccuracies including diagnosis and interventions may be present. In addition, the observation that GWTG hospitals are larger, more often teaching, and urban raises the issue of broad applicability to small rural communities, particularly the large number of critical access hospitals in the United States. Critical access hospitals make up 7.1% of GWTG hospitals. However, because most patients are cared for in larger urban settings, a significant percentage of the acute cardiovascular admissions are included in GWTG. It is also possible that poor-performing hospitals have not joined GWTG, and, therefore, the overall performance of the program overestimates actual US performance.

The program does not directly collect cost information, but linking to CMS data as discussed in the “GWTG’s Contribution to Increasing the Value of Health Care” section above may help. Although some information on comorbidities is available, more in-depth collection might ultimately be helpful. In addition, limited pre-event data are collected, but this may also be partially addressed by linking to administrative databases. Finally, we have limited data on functional status postdischarge at this time, although other programs, such as The Guideline Advantage, may be helpful in capturing outpatient quality of care and health status.

**Summary and Policy Recommendations**

Table 4 summarizes the key findings of GWTG and evidence from ≥200 peer-reviewed articles. Summary and policy recommendations are organized by section to highlight the links to the GWTG evidence base. Many of our recommendations, although specific for the GWTG program, are broadly applicable to other conditions. For example, general and vascular surgery, cardiovascular surgery, and critical care medicine all already have or have the potential to develop and leverage comprehensive programs with sophisticated clinical databases.

**Discussion and Conclusions**

The AHA GWTG Program is a national voluntary, sustainable model linking state-of-the-art quality improvement tools with a sophisticated and flexible database documenting the care of almost 3 million cardiovascular disease patients in almost 2000 US hospitals. Experience with previously published guidelines suggests that traditional educational interventions such as lectures and other simple dissemination strategies do not significantly impact practice in secondary stroke and coronary artery disease prevention. To change healthcare provider practice, implementation strategies must be coupled with novel guideline dissemination and systematic physician engagement strategies. The Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults identified the need for enabling strategies (eg, reminders), reinforcing strategies (eg, feedback), and predisposing strategies (eg, practice guidelines) to improve the quality of practice. All these evidence-based approaches to performance improvement are used by the GWTG program.
Table 4. Key Findings of GWTG and Evidence From Peer-Reviewed Articles

National implementation and impact of GWTG on quality of care

Summary

- The GWTG platform of clinical decision support tools, Webinars, educational resources, data collection tools, real-time feedback and benchmarking information is effective in improving cardiovascular quality and outcomes. Participating hospitals have demonstrated rapid and sustained improvement in evidence-based process measures in coronary artery disease, heart failure, and stroke.6,15
- Almost 3 million patients with heart failure, CAD, and stroke treated at >3000 (Figure 2) hospitals across the country have participated in GWTG (Figures 1 and 3).
- All types of hospitals across the United States (eg, large and small, academic and community, rural and urban hospitals) have participated and all have demonstrated significant improvement in care quality. GWTG patients are representative of patients treated for the same diseases across all hospitals in the United States.16
- GWTG-participating hospitals have improved care of patients with cardiovascular disease well beyond secular trends (that is, the improvements expected over time regardless of the intervention).7,16
- Unfortunately, many hospitals face financial challenges in supporting the trained staff required to optimally use GWTG tools despite the program’s low participation cost.

Policy recommendations

- State and national policy makers should explore approaches to improving the uptake of the GWTG model. Possible approaches include general legislation, support of accreditation initiatives, and financial incentives for participation, particularly in financially challenged organizations or for those who serve a disproportionate number of disadvantaged patients.
- Because greater participation translates to better delivery of care and better patient outcomes, policy makers should consider general or regional support for the GWTG program and other registries through creative partnerships and alliances. This would leverage the significant commitment of the AHA.
- Policy makers should provide incentives, such as the Electronic Health Record Incentive program, to standardize clinical information systems, health information exchange, and interoperability to reduce the major cost of manual chart abstraction for GWTG and other clinical performance improvement registries. This would better support electronic health record integration with quality improvement.

Promote assembly of data to better understand practice patterns and disease states

Summary

- The GWTG program provides a unique assessment of how clinicians and health systems translate best evidence (efficacy) into real-world practice and care (effectiveness).73
- These comparative effectiveness data facilitate evaluation of practice at the local, regional, and national level, informing providers and policy makers of variation (gaps) and opportunities to improve selected evidence-based interventions in specific settings. These data can facilitate novel interventions to overcome barriers in the equitable delivery of safe, reliable, and patient-centered care.
- Using this timely gap information, policy makers, the AHA, or local systems can then develop focused clinical initiatives. For example, the GWTG program developed additional complementary programs (Target: Stroke and Target: Heart Failure) when assessments from the GWTG registries revealed significant opportunity to safely decrease the door-to-needle time for stroke patients10,21 and increase the use of aldosterone antagonists in patients with HF20.
- Assessment of adherence and usability of GWTG measures can have a significant impact on the selection and prioritization of existing and new measures used by other organizations such as CMS, CDC, and The Joint Commission. Such harmonization is important for any national initiative and helps healthcare providers make data abstraction more efficient by consistently collecting the same data for all stakeholders.
- The GWTG registry facilitates assessment of new guidelines, their rate of uptake and potential unintended consequences. For example, GWTG-Stroke rapidly and accurately assessed the real-world impact of the expanded time window from 3 to 4.5 hours for the administration of tPA.26

Policy recommendations

- Policy makers should strongly consider partnering with performance improvement registries, such as GWTG, that concurrently measure and report performance. Such partnerships can potentially decrease the lag between the publication of evidence and the real-world uptake of life-saving interventions.
- Policy makers should facilitate the adoption of clinical registries such as GWTGs by all health systems to promote consistent and excellent care throughout a state or region.
- Policy makers should encourage the use of registries such as GWTG to promote equitable care for all patients.
- Leaders should facilitate the adoption of a few, valid, and reliable registries, rather than multiple databases from multiple governmental organizations, insurers, and other interested parties. Where possible, links to existing respected outpatient registries such as The Guideline Advantage program should be facilitated. This would help reduce the data abstraction burden of hospitals and health systems while ensuring the integration of data across the healthcare continuum.
- Before setting national guidelines, policy makers should use registry information to rigorously assess the potential benefits and unintended consequences of new guidelines and their associated measures.

Contribution to the value of health care

Summary

- The concept of value (quality/cost) is now driving US health care and is central to our approach to improving the performance of the US healthcare system. VBP is already an important driver of Medicare reimbursement.
- Many of the GWTG interventions focus on evidence-based secondary prevention. The GWTG-associated improvements in quality thus have the potential to decrease costs through reduction in readmissions,50 complications, and recurrent events.
- Substantial reductions in LOS were associated with the implementation of GWTG-Stroke among patients with stroke and transient ischemic attack admissions, suggesting that the acute-care intervention may have decreased in hospital complications and made care more efficient.40
- GWTG has improved care for all patient groups and has substantially reduced or, in some cases, eliminated, inequities in care between men and women, older and younger patients, and different race/ethnic groups.25,68–70

Policy recommendations

- Policy makers should encourage the use of registries such as GWTG as a way to potentially improve the value of care. The GWTG program is associated with significant increases in the quality of care and certain measures of efficiency such as the reduction in 30-day readmission rates

(Continued)
The GWTG program facilitates the dissemination of new knowledge and is associated with improved care across a broad representative range of patients, institutions, and domains of care. Participating hospitals improve care more rapidly than nonparticipating hospitals and that improvement is sustained over many years.

The data reflecting interventions and outcomes for these patients can be used to document current care, identify areas for improvement, test new measures, and benchmark performance. The GWTG program can then be used to rapidly drive change to close identified treatment gaps.

GWTG may improve the value of care (quality/cost) through rapid and sustained improvements in quality. GWTG is associated with improved care and the narrowing or elimination of treatment gaps for women, younger and older patients, and those of ethnic or racial minorities. GWTG can improve care quality while potentially contributing to decreases in the costs of care through associated decreases in length of stay, readmissions, and preventable complications.

Linking the granular clinical information in GWTG with administrative data can help drive CER, meaningful use, and multiple national and state initiatives to improve quality and decrease costs. For policy makers, the opportunities presented by GWTG to drive improved value in our health system are profound and exciting.
### Disclosures

<table>
<thead>
<tr>
<th>Writing Group Member</th>
<th>Employment</th>
<th>Research Grant</th>
<th>Other Research Support</th>
<th>Speakers' Bureau/ Honoraria</th>
<th>Expert Witness</th>
<th>Ownership Interest</th>
<th>Consultant/Advisory Board</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Gray Ellrodt</td>
<td>Berkshire Medical Center</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Gregg C. Fonarow</td>
<td>UCLA</td>
<td>NIH†; AHRQ†</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Medtronic*; Novartis†; Gambro*</td>
<td>None</td>
</tr>
<tr>
<td>Lee H. Schwamm</td>
<td>Massachusetts General Hospital</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Massachusetts Department of Public Health†; Genentech†</td>
<td>None</td>
</tr>
<tr>
<td>Nancy Albert</td>
<td>Cleveland Clinic</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Deepak L. Bhatt</td>
<td>VA Boston Healthcare System, Brigham and Women’s Hospital, TIMI Study Group</td>
<td>Amarin†; AstraZeneca†; Bristol-Myers Squibb†; Eisai†; Ethicon†; Medtronic†; Sanofi Aventis†; The Medicines Company†</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Christopher P. Cannon</td>
<td>Brigham and Women’s Hospital</td>
<td>Accumedics*; AstraZeneca†; Essentia*; GlaxoSmithKline†; Merck†; Regeneron*; Sanofi†; Takeda†</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Adrian F. Hernandez</td>
<td>Duke University</td>
<td>AHA†</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Mark A. Hlatky</td>
<td>Stanford University School of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Russell V. Luepker</td>
<td>University of Minnesota</td>
<td>CDC†; NIH†</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Pamela N. Peterson</td>
<td>Denver Health Medical Center</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Mathew Reeves</td>
<td>Michigan State University</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Eric Edward Smith</td>
<td>University of Calgary</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Member of Publications Committee, Registry of the Canadian Stroke Network*</td>
</tr>
</tbody>
</table>

This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be “significant” if (a) the person receives $10,000 or more during any 12-month period, or 5% or more of the person’s gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $10,000 or more of the fair market value of the entity. A relationship is considered to be “modest” if it is less than “significant” under the preceding definition.

*Modest.
†Significant.


## Reviewer Disclosures

<table>
<thead>
<tr>
<th>Reviewer</th>
<th>Employment</th>
<th>Research Grant</th>
<th>Other Research Support</th>
<th>Speakers’ Bureau/ Honoraria</th>
<th>Expert Witness</th>
<th>Ownership Interest</th>
<th>Consultant/ Advisory Board</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary Ann Bauman</td>
<td>INTEGRIS Health, Inc.</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>AHA-Chair of the GWTG Quality Improvement Sub-Committee</td>
<td>None</td>
</tr>
<tr>
<td>Paul Heidenreich</td>
<td>VA Palo Alto Healthcare System</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Moira K. Kapral</td>
<td>University of Toronto, Toronto General Hospital</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Ralph Sacco</td>
<td>University of Miami</td>
<td>NINDS†</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

This table represents the relationships of reviewers that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all reviewers are required to complete and submit. A relationship is considered to be “significant” if the person receives $10,000 or more during any 12-month period, or 5% or more of the person’s gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $10,000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.  

*Modified.†Significant.

## References


2. Fonarow GC, Gawlinski A. Rationale and design of the Cardiac Hospitalization Atherosclerosis Management Program at the University of California Los Angeles. *Am J Cardiol.* 2000;85:10A–17A.


27. Bhatt DL. Advancing the care of cardiac patients using registry data: going where randomized clinical trials dare not. JAMA. 2010;303:2188–2189.


KEY WORDS: AHA Scientific Statements ■ cardiovascular diseases ■ public health ■ public policy ■ quality of health care ■ registries
Synthesizing Lessons Learned From Get With The Guidelines: The Value of Disease-Based Registries in Improving Quality and Outcomes

A. Gray Ellrod, Gregg C. Fonarow, Lee H. Schwamm, Nancy Albert, Deepak L. Bhatt, Christopher P. Cannon, Adrian F. Hernandez, Mark A. Hlatky, Russell V. Luepker, Pamela N. Peterson, Mathew Reeves and Eric Edward Smith

_Circulation._ 2013;128:2447-2460; originally published online October 28, 2013;
doi: 10.1161/01.cir.0000435779.48007.5c

_Circulation_ is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2013 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/128/22/2447

Data Supplement (unedited) at:
http://circ.ahajournals.org/content/suppl/2013/10/23/01.cir.0000435779.48007.5c.DC1
http://circ.ahajournals.org/content/suppl/2014/03/20/01.cir.0000435779.48007.5c.DC2

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in _Circulation_ can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to _Circulation_ is online at:
http://circ.ahajournals.org/subscriptions/
Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”

Get With The Guidelines® Publications - Stroke, Heart Failure, Coronary Artery Disease
(As of 5/28/13)

2013:

Selim Krim: Do BNP Levels and Prognostic Value Vary by Race/Ethnicity in Patients Hospitalized with Heart Failure? JACC HF (in press) * AHA Young Investigator Runner Up


Feng Qian: Racial and Ethnic Differences in Outcomes in Older Patients with Acute Ischemic Stroke. CIRC CVQO (in press)

Michael L. James: Insurance Status and Outcome after Intracerebral Hemorrhage: Findings from Get With The Guidelines-Stroke. Journal of Stroke and Cerebrovascular Diseases (online)

Kociol: Are We Targeting the Right Metric for Heart Failure? Comparison of Hospital 30-Day Readmission Rates and Total Episode of Care Inpatient Days. AHJ (in press)


Zubin Eapen: Validated, Electronic Health Record Deployable Prediction Models for Assessing Patient Risk of 30-Day Rehospitalization and Mortality in Older Heart Failure Patients. JACC HF (in press)


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


2012:


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”

**Hospital Performance in Acute Ischemic Stroke With versus Without Adjustment for Stroke Severity.** JAMA. 2012;308(3):257-264. Epub 7/17/12


Prvu Bettger J,Lisa Kaltenbach, Reeves M, Smith EE, Fonarow G, Schwamm L, Peterson E. **Assessing stroke patients for rehabilitation during the acute hospitalization: findings from the Get With The Guidelines-Stroke Program.** Archives of Physical Medicine and Rehabilitation. Epub 7/30/12


Menon B, Saver J, Prabhakaran S, Reeves M, Liang L, Olson D, Peterson E, Hernandez A, Fonarow G, Schwamm L, Smith EE. **Risk Score for Intracranial Hemorrhage in Patients With Acute Ischemic Stroke Treated With Intravenous Tissue-Type Plasminogen Activator.** Stroke. (Epub 7/17/12)
Data Supplement

Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Allen N. Regional Variation in Recommended Treatments for Ischemic Stroke and TIA: Get With the Guidelines- Stroke 2003-2010. Stroke. Epub 5/15/12


Mountantonakis S. Presence of Atrial Fibrillation is Independently Associated with Adverse Outcomes in Patients Hospitalized with Heart Failure: An Analysis of GWTG-Heart Failure. [Epub 2/23/12] CircHF

El Husseini, N. Depression and Antidepressant use after Stroke and Transient Ischemic Attack. Stroke (in press) *AVAIL


Al-Khatib S. Trends in Use of Implantable Cardioverter Defibrillator Therapy Among Patients Hospitalized for Heart Failure: Have the Previously Observed Sex and Racial Disparities Improved Over Time? [Epub 1/27/12] Circ

Vivo, Rey. Care and Outcomes of Hispanic Patients Admitted with Heart Failure with Preserved or Reduced Ejection Fraction: Findings from Get With The Guidelines-Heart Failure. [Epub 3/13/12] Circ HF *YI Winner*

Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”

Xian, Ying. Data Quality in the American Heart Association Get With the Guidelines Stroke: Results from a National Data Validation Audit. [Epub 3/13/12] AHJ


Bangalore, Sripal. Quality of Care and Outcomes of Young Patients with ST-Segment Elevation Myocardial Infarction. AJM (in press) *YI Winner*

Qian, Feng (Johnson). Care and Outcomes of Asian Acute Myocardial Infarction Patients: Findings from the American Heart Association Get With The Guidelines-Coronary Artery Disease Program. [Epub 1/10/12] Circ CQO *YI Winner*

2011:


Heidenreich P, Zhao X, Hernandez A, Yancy C, Fonarow G. Patient and Hospital Characteristics Associated with Traditional Measures of Inpatient Quality of Care for Patients with Heart Failure. [Epub 2/9/12] AmHeart J 2012;163:239-245.e3 *Strategic*

Heidenreich P, Hernandez A, Yancy C, Liang L, Peterson E, Fonarow G. GWTG Program Participation, Process of Care and Outcome for Patients Hospitalized with HF. [Epub 1/10/12] Circ CQO *Strategic*


and Hospital Characteristics Among Medicare Beneficiaries Hospitalized with Ischemic Stroke. [Epub 10/6/11] Stroke 2012;43(1):44-49. PM:21980197 *Strategic*


Klein L, Grau-Sepulveda M, Bonow R, Hernandez A, Williams M, Bhatt D, Fonarow G. Quality of Care and Outcomes for Women Hospitalized with Heart Failure. [Epub 8/23/11] Circ Heart Fail, DOI: 10.1161/CIRCHEARTFAILURE.110.960484 *YI Winner*


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Medina H, Cannon C, Zhao X, Hernandez A, Bhatt D, Peterson E, Liang L, Fonarow G. Quality of Acute Myocardial Infarction Care and Outcomes in 33,997 Patients Aged 80 Years or Older: Results from GWTG-CAD. [Epub 8/10/11] (Am Heart J 2011;162:283-290.e2)


2010:
Incremental Value of Clinical Data Beyond Claims Data in Predicting 30 day Outcomes
Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”

after Heart Failure Hospitalization. [Epub 12/7/10] (Circ Cardiovasc Qual Outcomes. 2011;4:60-67.)


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Schwamm L, Reeves M, Pan W, Smith E, Frankel M, Olson D, Zhao X, Peterson E, Fonarow G. Race and Ethnicity, Quality of Care, and Outcomes in Ischemic Stroke. CIRC. (online) *Strategic*


Fonarow G, Reeves M, Zhao X, Olson D, Smith E, Saver J, Schwamm L. Age-Related Differences in Characteristics, Performance Measures, Treatment Trends, and Outcomes in Patients with Ischemic Stroke. (Circulation. 2010;121:879-891.)


2009:

Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Ambardekar A, Fonarow G, Dai D, Peterson E, Hernandez A, Cannon C, Krantz M. Quality of Care and In-Hospital Outcomes in Patients With Coronary Heart Disease in Rural and Urban Hospitals (from the Get With the Guidelines - Coronary Artery Disease Program). [Epub 11/14/09] Am J Cardiol 2010;105:139 –143


Heidenreich P, Lewis W, LaBresh K, Schwamm L, Fonarow G. Hospital Performance Recognition with the Get With The Guidelines Program and Mortality for Acute Myocardial Infarction and Heart Failure. (Am Heart J 2009;158:644-52.)*Strategic*


**2008:**


Krantz M, Tanner J, Horwich T, Yancy C, Albert N, Hernandez A, Dai D, Fonarow G. *The Influence of Hospital Length of Stay for Heart Failure on Quality of Care.* Am J Cardiol 2008;102:1693–1697


Horwich T, Hernandez A, Dai D, Yancy C, Fonarow G. *Cholesterol Levels and In-Hospital Mortality in Patients with Acute Decompensated Heart Failure.* Am Heart J. 2008;156:1170-6

Piccini JP, Hernandez AF, Dai D, Thomas KL, Lewis WR, Yancy CW, Peterson ED, Fonarow GC. *Utilization of Cardiac Resynchronization Therapy in Patients Hospitalized with Heart Failure.* Circulation. 2008; 118:926-933 *Strategic*


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”

Sumit Tickoo, Gregg C. Fonarow, Adrian F. Hernandez, Li Liang, Christopher P. Cannon. Weekend/Holiday vs. Weekday Hospital Discharge and Guideline Adherence (From the American Heart Association’s Get With The Guidelines – Coronary Artery Disease Database). (Am J Cardiol 2008;102:663–667)


LaBresh KA, Reeves MJ, Frankel MR, Albright D, Schwamm LH. Hospital Treatment of Patients with Ischemic Stroke or Transient Ischemic Attack with Get with the Guidelines. Arch Intern Med; Feb 2008; 168: 411-417 *Strategic*

2007:

Hernandez AF, Fonarow GC, Liang L, Al-Khatib SM, Curtis LH, LaBresh KA, Yancy CW, Albert NM. A Gender and Racial Gap in Internal Cardioverter Defibrillator Use Among Hospitalized Heart Failure Patients. JAMA; 298 (13): 1525-32. *Strategic*

Steinberg BA, Cannon CP, Hernandez AF, Pan W, Peterson ED, Fonarow GC. Medical Therapies and Invasive Treatments for Coronary Artery Disease in Overweight Patients: Understanding the “Obesity Paradox” in the Get With The Guidelines Database. Am J Cardiol 2007; 100:1331–1335

LaBresh KA, Fonarow GC, Smith SC, Bonow RO, Smaha LC, Tyler PA, Hong Y, Albright D, Ellrodt AG. Improved Treatment of Hospitalized Coronary Artery Disease Patients with the Get With The Guidelines Program. Crit Path Cardiol; 6 (3): 98-105


2004:
Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


2003:

Editorials:


Hong Y, Labresh KA. Overview of the American Heart Association “Get With the Guidelines” Programs. Coronary Heart Disease, Stroke, and Heart Failure. Crit Path Cardiol 2006; 5: 179–186


LaBresh KA. Get with the guidelines to improve heart care. Ital Heart J 2004; 5:489-93.

Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Fonarow, Gregg C., C. Ballantyne In-Hospital Initiation of Lipid-Lowering Therapy for Patients With Coronary Heart Disease: The Time Is Now, Circulation, Jun 2001; 103: 2768 - 2770.

*Young Investigator Research Grant Award Winner
Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”

Get With The Guidelines® Publications - Stroke, Heart Failure, Coronary Artery Disease
(As of 5/28/13)

2013:

Selim Krim: Do BNP Levels and Prognostic Value Vary by Race/Ethnicity in Patients Hospitalized with Heart Failure? JACC HF (in press) * AHA Young Investigator Runner Up


Feng Qian: Racial and Ethnic Differences in Outcomes in Older Patients with Acute Ischemic Stroke. CIRC CVQO (in press)

Michael L. James: Insurance Status and Outcome after Intracerebral Hemorrhage: Findings from Get With The Guidelines-Stroke. Journal of Stroke and Cerebrovascular Diseases (online)

Kociol: Are We Targeting the Right Metric for Heart Failure? Comparison of Hospital 30-Day Readmission Rates and Total Episode of Care Inpatient Days. AHJ (in press)


Zubin Eapen: Validated, Electronic Health Record Deployable Prediction Models for Assessing Patient Risk of 30-Day Rehospitalization and Mortality in Older Heart Failure Patients. JACC HF (in press)


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


2012:


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Allen N. Regional Variation in Recommended Treatments for Ischemic Stroke and TIA: Get With the Guidelines- Stroke 2003-2010. Stroke. Epub 5/15/12


Mountantonakis S. Presence of Atrial Fibrillation is Independently Associated with Adverse Outcomes in Patients Hospitalized with Heart Failure: An Analysis of GWTG-Heart Failure. [Epub 2/23/12] CircHF

El Husseini, N. Depression and Antidepressant use after Stroke and Transient Ischemic Attack. Stroke (in press) *AVAIL


Al-Khatib S. Trends in Use of Implantable Cardioverter Defibrillator Therapy Among Patients Hospitalized for Heart Failure: Have the Previously Observed Sex and Racial Disparities Improved Over Time? [Epub 1/27/12] Circ

Vivo, Rey. Care and Outcomes of Hispanic Patients Admitted with Heart Failure with Preserved or Reduced Ejection Fraction: Findings from Get With The Guidelines-Heart Failure. [Epub 3/13/12] Circ HF *YI Winner*

Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”

Xian, Ying. Data Quality in the American Heart Association Get With the Guidelines Stroke: Results from a National Data Validation Audit. [Epub 3/13/12] AHJ


Bangalore, Sripal. Quality of Care and Outcomes of Young Patients with ST-Segment Elevation Myocardial Infarction. AJM (in press) *YI Winner*

Qian, Feng (Johnson). Care and Outcomes of Asian Acute Myocardial Infarction Patients: Findings from the American Heart Association Get With The Guidelines-Coronary Artery Disease Program. [Epub 1/10/12] Circ CQO *YI Winner*

2011:


Heidenreich P, Zhao X, Hernandez A, Yancy C, Fonarow G. Patient and Hospital Characteristics Associated with Traditional Measures of Inpatient Quality of Care for Patients with Heart Failure. [Epub 2/9/12] AmHeart J 2012;163:239-245.e3 *Strategic*

Heidenreich P, Hernandez A, Yancy C, Liang L, Peterson E, Fonarow G. GWTG Program Participation, Process of Care and Outcome for Patients Hospitalized with HF. [Epub 1/10/12] Circ CQO *Strategic*


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”

and Hospital Characteristics Among Medicare Beneficiaries Hospitalized with Ischemic Stroke. [Epub 10/6/11] Stroke 2012;43(1):44-49. PM:21980197 *Strategic*


Klein L, Grau-Sepulveda M, Bonow R, Hernandez A, Williams M, Bhatt D, Fonarow G. Quality of Care and Outcomes for Women Hospitalized with Heart Failure. [Epub 8/23/11] Circ Heart Fail, DOI: 10.1161/CIRCHEARTFAILURE.110.960484 *YI Winner*


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Medina H, Cannon C, Zhao X, Hernandez A, Bhatt D, Peterson E, Liang L, Fonarow G. Quality of Acute Myocardial Infarction Care and Outcomes in 33,997 Patients Aged 80 Years or Older: Results from GWTG-CAD. [Epub 8/10/11] (Am Heart J 2011;162:283-290.e2)


2010:
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”

after Heart Failure Hospitalization. [Epub 12/7/10] (Circ Cardiovasc Qual Outcomes. 2011;4:60-67.)


Data Supplement

Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Schwamm L, Reeves M, Pan W, Smith E, Frankel M, Olson D, Zhao X, Peterson E, Fonarow G. Race and Ethnicity, Quality of Care, and Outcomes in Ischemic Stroke. CIRC. (online) *Strategic*


Fonarow G, Reeves M, Zhao X, Olson D, Smith E, Saver J, Schwamm L. Age-Related Differences in Characteristics, Performance Measures, Treatment Trends, and Outcomes in Patients with Ischemic Stroke. (Circulation. 2010;121:879-891.)


2009:

Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Ambardekar A, Fonarow G, Dai D, Peterson E, Hernandez A, Cannon C, Krantz M. Quality of Care and In-Hospital Outcomes in Patients With Coronary Heart Disease in Rural and Urban Hospitals (from the Get With the Guidelines - Coronary Artery Disease Program). [Epub 11/14/09] Am J Cardiol 2010;105:139 –143


Heidenreich P, Lewis W, LaBresh K, Schwamm L, Fonarow G. Hospital Performance Recognition with the Get With The Guidelines Program and Mortality for Acute Myocardial Infarction and Heart Failure. (Am Heart J 2009;158:644-52.)*Strategic*


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


2008:

Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Horwich T, Hernandez A, Dai D, Yancy C, Fonarow G. Cholesterol Levels and In-Hospital Mortality in Patients with Acute Decompensated Heart Failure. Am Heart J. 2008;156:1170-6


Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”

Sumit Tickoo, Gregg C. Fonarow, Adrian F. Hernandez, Li Liang, Christopher P. Cannon. Weekend/Holiday vs. Weekday Hospital Discharge and Guideline Adherence (From the American Heart Association’s Get With the Guidelines – Coronary Artery Disease Database). (Am J Cardiol 2008;102:663–667)


LaBresh KA, Reeves MJ, Frankel MR, Albright D, Schwamm LH. Hospital Treatment of Patients with Ischemic Stroke or Transient Ischemic Attack with Get with the Guidelines. Arch Intern Med; Feb 2008; 168: 411-417 *Strategic*

2007:

Hernandez AF, Fonarow GC, Liang L, Al-Khatib SM, Curtis LH, LaBresh KA, Yancy CW, Albert NM. A Gender and Racial Gap in Internal Cardioverter Defibrillator Use Among Hospitalized Heart Failure Patients. JAMA; 298 (13): 1525-32. *Strategic*

Steinberg BA, Cannon CP, Hernandez AF, Pan W, Peterson ED, Fonarow GC. Medical Therapies and Invasive Treatments for Coronary Artery Disease in Overweight Patients: Understanding the “Obesity Paradox” in the Get With The Guidelines Database. Am J Cardiol 2007; 100:1331–1335

LaBresh KA, Fonarow GC, Smith SC, Bonow RO, Smaha LC, Tyler PA, Hong Y, Albright D, Ellrodt AG. Improved Treatment of Hospitalized Coronary Artery Disease Patients with the Get With The Guidelines Program. Crit Path Cardiol; 6 (3): 98-105


2004:
Data Supplement

Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


2003:


Editorials:


Hong Y, Labresh KA. Overview of the American Heart Association “Get With the Guidelines” Programs. Coronary Heart Disease, Stroke, and Heart Failure. Crit Path Cardiol 2006; 5: 179–186


LaBresh KA. Get with the guidelines to improve heart care. Ital Heart J 2004; 5:489-93.

Data Supplement
Ellrodt et al. “Synthesizing Lessons Learned from Get With The Guidelines (GWTG): The Value of Disease Based Registries in Improving Quality and Outcomes”


Fonarow, Gregg C., C. Ballantyne In-Hospital Initiation of Lipid-Lowering Therapy for Patients With Coronary Heart Disease: The Time Is Now, Circulation, Jun 2001; 103: 2768 - 2770.

*Young Investigator Research Grant Award Winner