Achieving best outcomes for patients with cardiovascular disease in China by enhancing the quality of medical care and establishing a learning health-care system

Lixin Jiang*, Harlan M Krumholz*, Xi Li, Jing Li, Shengshou Hu

China has an immediate need to address the rapidly growing population with cardiovascular disease events and the increasing number of people living with this illness. Despite progress in increasing access to services, China faces the dual challenge of addressing gaps in quality of care and producing more evidence to support clinical practice. In this Review, we address opportunities to strengthen performance measurement, programmes to improve quality of care, and national capacity to produce high-impact knowledge for clinical practice. Moreover, we propose recommendations, with implications for other diseases, for how China can immediately make use of its Hospital Quality-Monitoring System and other existing national platforms to assess and improve performance of medical care, and to generate new knowledge to inform clinical decisions and national policies.

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Abstract

China has an immediate need to address the rapidly growing population with cardiovascular disease events and the increasing number of people living with this illness. Despite progress in increasing access to services, China faces the dual challenge of addressing gaps in quality of care and producing more evidence to support clinical practice. In this Review, we address opportunities to strengthen performance measurement, programmes to improve quality of care, and national capacity to produce high-impact knowledge for clinical practice. Moreover, we propose recommendations, with implications for other diseases, for how China can immediately make use of its Hospital Quality-Monitoring System and other existing national platforms to assess and improve performance of medical care, and to generate new knowledge to inform clinical decisions and national policies.

Table 1: Quality measures for acute myocardial infarction and acute ischaemic stroke in China, the USA, and the UK

	China	USA	UK
Quality indicators for management of acute myocardial infarction	Quality control indicators for six specific diseases:[42] • Aspirin at presentation (clopidogrel if any contraindications) • Left ventricular function assessment • Reperfusion therapy (for STEMI only): door-to-needle <30 min; door-to-balloon <90 min; transfer out for primary PCI treatment • β blockers at admission • Aspirin, β blockers, ACE inhibitors or ARB, and statins during hospital stay and discharge • Health education • Length of hospital stay and total cost Indicators of medical quality management and control for tertiary general hospitals:[43] • In-hospital mortality • Readmission within 31 days	Hospital Quality Alliance:[44] • Median time to transfer to another facility for acute coronary intervention • Median time to ECG • Fibrinolytic therapy received within 30 min of emergency department arrival • Aspirin on arrival • Fibrinolytic therapy received within 30 min of hospital arrival • Timing of receipt of primary PCI • Aspirin prescribed at discharge • Statin prescribed at discharge • Risk-standardised 30-day mortality rate • Risk-standardised 30-day readmission rate • Risk-standardised payment	NICE quality measures:[45] • Diagnosis using the criteria in the universal definition[46] • Risk assessment using an established risk-scoring system in patients with non-STEMI or unstable angina • Length of time taken for intermediate-risk or high-risk patients with non-STEMI or unstable angina to receive coronary angiography after admission • Length of time taken for adults with non-STEMI or unstable angina who are clinically unstable to receive coronary angiography • Coronary angiography for patients who were unconscious after cardiac arrest caused by suspected acute STEMI • Patients with acute STEMI who present within 12 h of symptom onset receive primary PCI within 120 min of when fibrinolysis could have been given NSF for CHD performance indicators:[47] • Patients eligible for thrombolysis receiving it within 60 min of call for professional help • β blockers at discharge • Death during index admission for patients aged 35–74 years • Death within 30 days of infarct for patients aged 35–74 years

STEMI=ST-segment elevation myocardial infarction. PCI=percutaneous coronary intervention. ACE=angiotensin-converting enzyme. ARB=angiotensin receptor blocker. ECG=electrocardiogram. NICE=National Institute for Health and Care Excellence. NSF=National Service Framework. CHD=coronary heart disease. NIHSS=National Institutes of Health Stroke Scale. tPA=tissue plasminogen activator. DVT=deep-vein thrombosis. rtPA=recombinant tPA. TIA=transient ischemic attack. HQMS=Hospital Quality-Monitoring System. NCDR=National Cardiovascular Data Registry. AHA=American Heart Association. MINAP=Myocardial Ischemia National Audit Project. SINAP=Stroke Improvement National Audit Programme. SSNAP=Sentinel Stroke National Audit Programme. CMS=Centers for Medicare & Medicaid Services. NHS=National Health Service.

Table 1: Continued

	China	USA	UK
Quality indicators for management of acute ischaemic stroke	Quality control indicators for six specific diseases:[42] • Reception procedure (follow the procedure, NIHSS assessment, CT scan, complete blood count), biochemistry, and coagulation function tests within 45 min of hospital arrival • Anticoagulant treatment for patients with atrial fibrillation • Assessment for tPA or urokinase • Aspirin or clopidogrel within 48 h of admission • Lipid profile and dysphagia assessment • Prevention for DVT • Aspirin or clopidogrel at discharge • Health education • Vascular function assessment within 24 h of admission • Hospital length of stay and total cost • Indicators of medical quality management and control for tertiary general hospitals:[43] • In-hospital mortality • Readmission within 31 days	Get With The Guidelines (stroke) quality-of-care measures:[48] • Intravenous rtPA within 3 h of symptom onset • Complications, intravenous rtPA • Early antithrombotic therapy • DVT prophylaxis • Antithrombotic therapy at discharge • Anticoagulation agents at discharge for atrial fibrillation • Smoking cessation advice • LDL cholesterol measured • Lipid-lowering agent at discharge if LDL >100 mg/dL or if patient is taking lipid-lowering agents on admission • Lipid-lowering agent prescribed at discharge for all patients except those with untreated LDL <100 mg/dL • Weight and diabetes management Hospital Compare:[49] • Thrombolytic therapy within 3 h of symptom onset • Antithrombotic therapy by end of hospital day 2 • DVT prophylaxis • Discharged on antithrombotic therapy • Anticoagulation therapy for atrial fibrillation or flutter • Discharged on statin medication • Stroke education • Assessed for rehabilitation	NICE stroke quality standard:[50] • Screened for stroke or TIA outside hospital by ambulance staff • Brain imaging within 1 h of arrival at hospital • Admitted directly to a specialist acute stroke unit and assessed for thrombolysis • Receive thrombolysis after assessment • Swallowing screened within 4 h of admission to hospital, before being given any oral food, fluid, or drugs • Assessed and managed by stroke nursing staff and at least one member of the specialist rehabilitation team within 24 h of admission • Assessed and managed by all relevant members of the specialist rehabilitation team within 72 h of admission • Documented multidisciplinary goals agreed within 5 days of admission • Continual inpatient rehabilitation after completion of acute diagnosis and treatment of patients in specialist stroke rehabilitation unit • A minimum of 45 min of each active therapy that is required, for a minimum of 5 days a week • Treatment plan reassessed and implemented for patients with loss of bladder control • Screen for mood disturbance and cognitive impairment • Followed up within 72 h for assessment and continual management for patients discharged with residual stroke-related problems • Get care from those with clear information and management plan, and sufficient practical training

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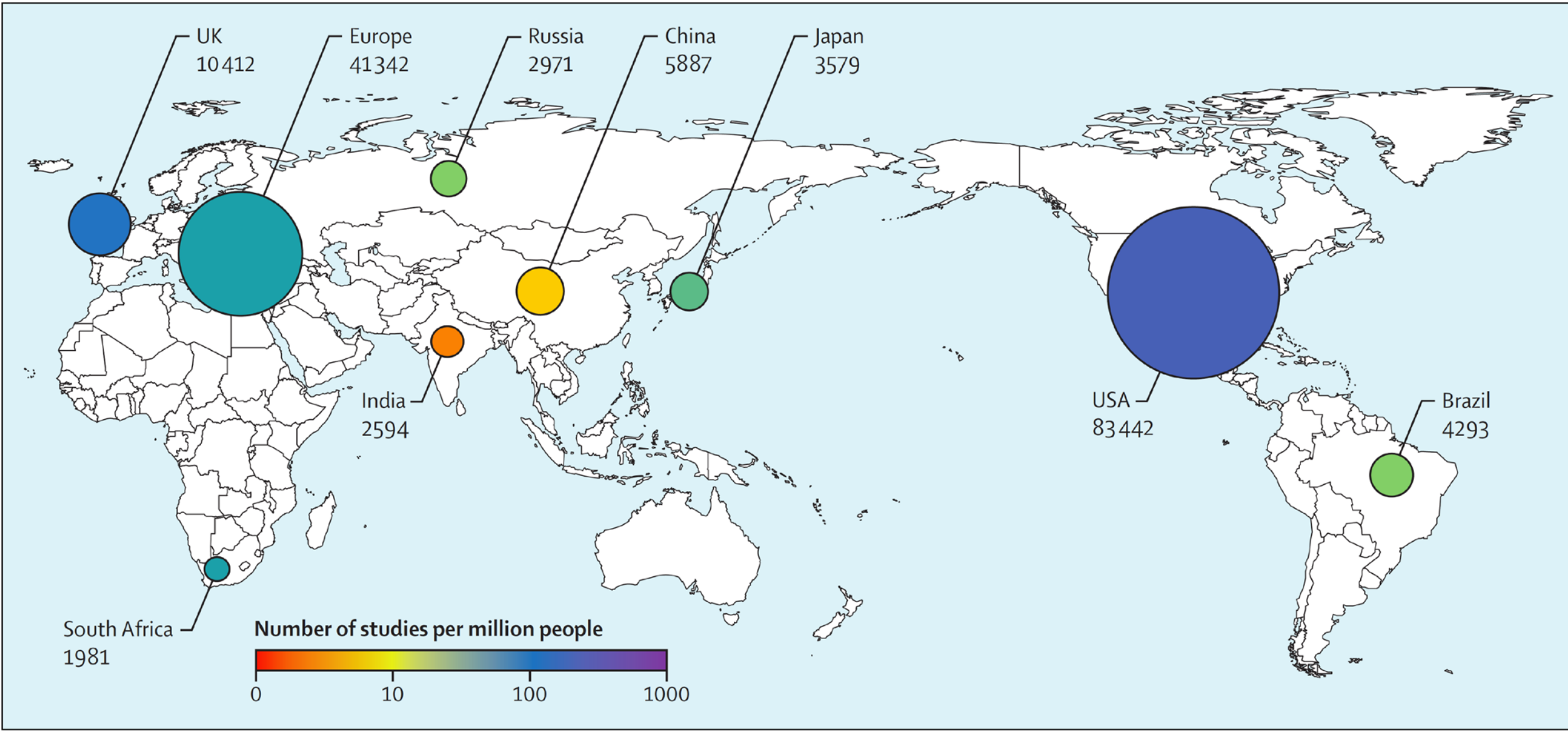
Table 1: Continued

	China	USA	UK
Data measurement systems	HQMS—an official data collection system covering all tertiary hospitals; requires the National Health and Family Planning Commission (formerly the Ministry of Health) to upload a dataset of face sheet (ie, cover page) information on all inpatients' medical records daily, which includes patients' social identification, demographic characteristics, length of hospital stay, principal admission diagnosis, discharge diagnosis (principal and comorbidities), special treatments (procedures and surgeries), patient outcomes (death, non-recovery, improvement, or complete recovery), presence or absence of in-hospital infection, transfusion, and fee for inpatient management	• Hospital Compare—a national initiative covering more than 4000 Medicare-certified hospitals; collects inpatient information for certain conditions (including acute myocardial infarction and stroke) from more than 40 million people aged 65 years and older • NCDR ACTION-Get With The Guidelines—a national registry of acute myocardial infarction funded by the American College of Cardiology and AHA. It helps hospitals to apply clinical guideline recommendations in their facilities and provides instruments to measure care and achieve quality improvement goals • Get With The Guidelines (stroke)—a national stroke registry and quality improvement programme funded by AHA. Since its initiation in 2003, 1656 hospitals have entered more than 2 million patient records into the database • Paul Coverdell National Acute Stroke Registry—a national registry on acute stroke covering more than 300 hospitals in 11 states, which is funded by the US Centers for Disease Control	• MINAP—a national registry of acute myocardial infraction that started in late 1998 and covers hospitals, ambulance services, and cardiac networks in England and Wales. The data allowed clinicians to examine the management of myocardial infarction within their hospitals against targets specified by the NSF for CHD. MINAP is the first national audit to release annual reports showing hospital performance against NSF targets in the public domain • SINAP and SSNAP—SINAP was a national clinical registry that collected information from hospitals in England on their first 72 h of acute stroke care. Its results showed performance against important aspects of acute stroke care, including 12 key stroke indicators, and were made public. SSNAP has superseded SINAP since December, 2012, and is now the source of stroke data nationally, which collects a minimum dataset for every patient with stroke

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Table 1: Continued

	China	USA	UK
Quality accountability mechanisms	None	• Hospital value-based purchasing is part of the CMS' longstanding effort to link Medicare's payment system to value-based care across the country.[51] If a hospital's risk-adjusted readmission rate for some patients exceeds the average level, the CMS penalises it in the following year for all Medicare admissions in proportion to its rate of excess readmission of patients for the target disease[52] • The CMS will continue to conduct regulation and enforcement activities to ensure that Medicare hospitals comply with federal standards for patient health and safety, and quality of care[53]	• Hospitals are required to participate in the national audit • The NHS is planning to incentivise good-quality care—eg, paying a higher tariff for more rapid angiography for non-STEMI

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Figure: Global map of studies registered with ClinicalTrials.gov in major economies
Multinational studies were counted in each of the countries involved.

Table 2: Engagement of stakeholders in quality improvement and evidence generation

	Short-term commitments	Long-term commitments
Government (as policy makers and health insurance agencies)	• Construct an administrative claims data system, based on the HQMS, with high-quality data and comprehensive analysis • Set up national clinical registries focusing on quality improvement • Analyse quality metrics every 3 months and make the results publicly available • Establish unique standards for electronic medical record system	• Expand the HQMS to primary and secondary hospitals • Link the HQMS with other data sources (eg, data from the universal public insurance system) • Incorporate standardised electronic medical record system into regulatory requirements for hospitals
Professional societies	• Establish a national clinical research roadmap • Issue and update clinical practice guidelines • Renew quality indicators on the basis of new evidence	• Promote training on clinical research methods
Clinical research communities	• Use existing data (eg, from the HQMS) for quality measurement • Foster sustainable collaborative research networks	• Develop methods for dissemination and adoption of protocols and guidelines
Hospitals	• Establish quality workgroup and set up systems for quality monitoring • Examine the current quality status within the hospital and set improvement goals • Assess varied quality improvement strategies for implementation	• Develop and pilot coordination with other hospitals • Ensure interoperability of electronic health records
Doctors	• Tailor treatment strategies to meet specific patient needs • Empower patients for decision making • Self-assess the care provided and identify improvement opportunities	• Use decision support software and patient self-management methods • Ensure the accuracy and comprehensiveness of medical records and data standards in documentation
Patients	• Engagement as data donors	• Engagement as data donors

HQMS=Hospital Quality-Monitoring System.

Table 3: Quality improvement initiatives and achievements for care of acute myocardial infarction and acute ischaemic stroke care in the USA, the UK, and India

	USA	UK	India
Acute myocardial infarction	**Initiatives:** • Door to balloon (D2B) Alliance • AHA Get With The Guidelines (coronary artery disease) **Achievements:** • Median door-to-balloon time declined from 96 min in 2005 to 64 min in 2010. Corresponding increases are seen in the percentage of patients who had times <90 min (44·2% to 91·4%) and <75 min (27·3% to 70·4%) • Reperfusion rates decreased from 55% in 1990 to 94% in 2009[18,86] • 30-day mortality decreased from 18·8% in 1995 to 15·8% in 2006[16]	**Initiatives:** • Myocardial Ischemia National Audit Project • NHS Heart Improvement Programme • National Infarct Angioplasty Project **Achievements:** • Between 2003 and 2010, mortality declined by 57% for STEMI, and 34% for non-STEM[87] • Primary PCI was given to 71% of patients in 2013,[88] compared with 49% in 2009[89] • Primary PCI within 90 min of arrival was achieved in 92·1% of patients in 2013, compared with 52·2% in 2004[88]	**Initiative:** • STEMI India[90] **Achievements:** • In a pilot study of TN-STEMI, 58% of 1804 patients with STEMI were shifted for pharmacoinvasive treatment in 2014, compared with 13% of 992 in 2013[91]
Acute ischaemic stroke	**Initiatives:** • AHA Get With The Guidelines (stroke) • National Stroke Association Stroke Center Network hospital stroke programme **Achievements:** • Proportion of patients given intravenous tPA increased from 4·0% in 2003 to 7·0% in 2011[92] • Door-to-needle time for tPA administration declined from 77 min in 2003 to 67 min in 2009[93] • In-hospital mortality decreased from 9·93% in 2003 to 8·25% in 2009[93] • 30-day mortality declined by 4·7% between 1999 and 2011	**Initiatives:** • National Sentinel Stroke Audit • Sentinel Stroke National Audit Programme[94] **Achievement:** • Intravenous rtPA was 10·3% in 2011–12,[95] compared with 1·4% in 2008[96]	**Initiative:** • National Stroke Registry Programme • Achievements: none

AHA=American Heart Association. NHS=National Health Service. STEMI=ST-segment elevation myocardial infarction. PCI=percutaneous coronary intervention. tPA=tissue plasminogen activator. rtPA=recombinant tPA.

Key messages

- China has been strengthening its health-care system through far-reaching health-care reform policies. However, facing the huge and increasing burden of cardiovascular disease, additional eff orts are needed to ensure that individual patients are receiving care that enables them to achieve the best possible health outcomes.
- Although much progress has been made in application of new evidence in clinical practice, previous studies and government reports identified substantial gaps between evidence and practice in cardiovascular care in China, which suggest opportunities for quality improvement.
- A major barrier to quality of care in China is the inadequate quality measurement system. No mechanism exists to link performance with the interests of care providers, despite some achievements that have been made in development of a national clinical information system.
- An urgent need is to expand the evidence for what strategies work best for which subgroup of patients and how best to provide medical care in China, where care for cardiovascular disease has a deficit of local evidence about effectiveness and safety of treatments.
- Acknowledging insufficient capacities for clinical research, the Chinese Government has initiated long-term investments in clinical research that generate evidence for policy formulation, including the founding of Chinese National Clinical Research Centers.
- China needs to use existing clinical information platforms to establish measurements on the basis of claims data and clinical registries, assess performance through the use of such measurements, and improve performance through strengthened accountability systems.
- China needs to develop a national clinical research roadmap on best practices and how performance could be improved in local contexts. Moreover, it is crucial to build a learning health-care system that engages stakeholders and will produce actionable clinical knowledge in a more cost-effective and timely way.

Conclusion

- China has made remarkable advances to modernize its health-care system.
- Since 2003, it has achieved substantial improvement in access to and use of health services and in hospital capacity. However, the growing access to services needs to be accompanied by striking improvements in quality.
- To achieve the best possible outcomes, pragmatic efforts will be needed to improve the quality of care and generate useful evidence through the establishment of a learning health-care system.
- Experience with cardiovascular disease can serve as a model for other illnesses.
- Moreover, work in China can serve as a model of moving to a learning health-care system, in which every individual receives care based on best practices and every experience is used to strengthen the system and advance knowledge for the future.
- China can achieve this goal through coordination of efforts, commitment to transparency around performance, investment in practical research, use of technological advances, and a focus on the experience of each individual who seeks care from health professionals and the health-care system.