Strengthening infection prevention and control and systematic surveillance of healthcare associated infections in India

Establishing and expanding government led networks to strengthen infection prevention and control and healthcare associated infection surveillance are essential to effectively tackle antimicrobial resistance. **Soumya Swaminathan and colleagues** discuss the progress in India

Antimicrobial resistance (AMR) and the spread of multidrug resistant bacteria is a global patient safety problem and a major public health concern.¹ In India, as elsewhere in South East Asia, many interlinked factors—including overuse of antibiotics, limited clinical diagnostic and laboratory capacity, and poor infection control, hygiene, and sanitation—have contributed to the emergence and spread of AMR.²⁻⁴

Healthcare facilities are high risk environments for the development and spread of drug resistance⁵⁻⁸ and frequently have the highest burden of multidrug resistant

pathogens, such as carbapenem resistant Enterobacteriaceae. Healthcare associated infections thus increase the threat of AMR and contribute to poor patient outcomes.⁹⁻¹¹ The data available indicate that the burden of healthcare associated infections in low and middle income countries like India is high, with an estimated pooled prevalence of 15.5 per 100 patients, more than double the prevalence in Europe and the US.¹² Infection prevention and control measures and practices reduce the opportunities for resistant pathogens to spread in healthcare facilities. They are therefore important to efforts to contain AMR.¹³ At present, however, a lack of adequate systems and infrastructure for infection prevention and control in many healthcare facilities contributes to the development of healthcare associated infections and the spread of resistant pathogens.^{10 14}

We describe the critical role of effective measures to detect, monitor, and prevent healthcare associated infections and to strengthen infection prevention and control programmes in Indian healthcare facilities as part of a comprehensive national response to AMR.¹⁴⁻¹⁶

Surveillance of healthcare associated infections in India: current gaps

In India, accurate estimates of the burden of healthcare associated infections are limited by the absence of reliable and routine standardised surveillance data. Published reports of healthcare associated infections are mostly from individual health facilities and include short term prospective studies and point prevalence surveys conducted in selected patient units of large hospitals.¹⁷⁻²¹ These indicate a prevalence of healthcare associated infections ranging from 7 to 18 per 100 patients, which is similar to that reported from other low and middle income countries. As in other settings, healthcare associated infections in India are associated with longer hospital stays, increased mortality, and added costs.^{18 19 21}

The frequent use of indwelling devices is also reported, particularly in intensive care units, where one centre reported that over 70% of patients had indwelling

devices in its intensive care unit for more than 48 hours.¹⁸ While microbiological confirmation of the healthcare associated infections was not a requirement in each of these reports, the data indicate that many of these infections were due to multidrug resistant pathogens, including methicillin resistant *Staphylococcus aureus* (MRSA) and extended spectrum β -lactamase producing and carbapenem resistant Enterobacteriaceae, *Pseudomonas* spp, and *Acinetobacter* spp.^{18 19} However, the results reported are not comparable across studies or sites in India as the healthcare facilities did not necessarily use standardised case definitions and surveillance methods.

Over the past several years, 40 private sector and academic hospitals in 20 cities in India have participated in surveillance through the International Nosocomial Infection Control Consortium, which uses a standardised method, and case definitions for surveillance of healthcare associated infections.²² Their recent publication gives pooled rates of healthcare associated infections at participating sites for the years 2004-13 and compares these rates with reported benchmarks. The data show that rates of healthcare associated infections from the Indian sites are consistently higher than rates reported by the National Healthcare Safety Network in the USA.²³ The consortium experience suggests routine network surveillance of healthcare associated infections is of interest and feasible in India. Although these data, as well as those from surveillance conducted at individual centres, give the incidence of healthcare associated infections at participating facilities, the findings have not led to broader policy changes for infection prevention and control in India.

The main purpose of conducting routine surveillance of healthcare associated infections is to provide data that can lead to the implementation of effective prevention strategies to reduce the incidence of drug resistant infections. In India, and other countries in South East Asia, standardised surveillance of healthcare associated infections led by government

KEY MESSAGES

- Systems, policies, and procedures to measure and prevent healthcare associated infections are essential for a comprehensive response to antimicrobial resistance
- Surveillance of healthcare associated infections should drive the implementation of evidence based infection prevention and control practices to reduce the incidence of these infections, decrease the transmission of resistant pathogens in healthcare settings, and improve patient safety
- The quality and consistency of surveillance data on healthcare associated infections are limited in India
- Ministry of Health agencies in India, with support from the Centers for Disease Control and Prevention, are implementing healthcare associated infection surveillance that is tied to strengthening infection prevention and control practices and characterising antimicrobial resistance patterns
- In India, and elsewhere in South East Asia, government led initiatives can be used to advocate for and prioritise commitment and funding to sustain healthcare associated infection surveillance and infection prevention and control programmes

health agencies and closely linked to efforts to strengthen infection prevention and control has a greater potential than individual surveys to bring about policy and practice changes. Government ownership and coordination of efforts to reduce healthcare associated infections and improve infection prevention and control also raises the profile of these problems, increases the likelihood of sustainable networks for surveillance and interventions, and encourages government led policy solutions. In the US, surveillance conducted through the National Healthcare Safety Network has been essential to describe the magnitude of the public health threat of healthcare associated infections. This has led to nationwide policies and prevention efforts that have resulted in substantial reductions in some healthcare associated infections, including central line associated bloodstream infections and surgical site infections.^{7 14}

Infection prevention and control in India

Although hospital accreditation is not mandatory in India, groups like the autonomous National Accreditation Board of Hospitals and the National Health Mission's National Health Systems Resource Centre have incorporated programmes on infection prevention and control, including surveillance of healthcare associated infections, as a core part of the review and certification process.^{24 25} At the national level, there has been growing recognition of the need for policy and guidance documents, and in 2016 the Indian Council of Medical Research released guidelines on infection prevention and control.²⁶ In addition, as part of the national *Swachh Bharat Abhiyan* (clean India mission) the National Health Mission launched *Kayakalp* (clean hospital initiative), which aims to promote and reward cleanliness, hygiene, and infection control practices in public healthcare facilities.²⁷

Despite these initiatives, the successful implementation of an infection prevention and control programme in Indian healthcare settings faces some important challenges, including insufficient funding and human resources, hospital overcrowding, and low nurse-to-patient ratios even in intensive care units.^{15 23} Nevertheless, there is clear interest among doctors and other providers in healthcare facilities to improve infection prevention and control. Many facilities have started hospital infection control committees, although with varying effectiveness. Some institutes have also begun targeted infection control interventions, such as the use of infection prevention and control bundles to prevent surgical site infections and infections from indwelling devices.¹⁹

Data from a few facilities in India suggest that the implementation of such bundles is feasible and can reduce infection rates.^{28 29} Long term implementation of recommended procedures will require concerted efforts to strengthen infection prevention and control capacity among staff in healthcare settings. Thus, it is important to find ways to support standardised surveillance of healthcare associated infections in India and link the data to the implementation of infection control policies, interventions, and indicators that are suitable for local needs. Demonstrated improvements in infection control practices and reductions in healthcare associated infections can help secure the commitment and funding needed to sustain these infection prevention and control programmes.

New initiatives to address gaps in India

As part of the national response to AMR, the Indian Council of Medical Research and the National Centre for Disease Control started AMR surveillance networks in 2013 and 2014, respectively.^{30 31} These surveillance efforts are an important part of the Indian Ministry of Health and Family Welfare's recently launched five year national action plan on AMR.³² The networks currently comprise 25 public and private sector hospital laboratories across the country that report antibiotic susceptibility data on important resistant pathogens. In 2015 the Indian Council of Medical Research and the National Centre for Disease Control, with technical support from the US Centers for Disease Control and Prevention (CDC), helped their existing AMR networks begin programmes for the systematic assessment and improvement of infection prevention and control practices and the implementation of standardised surveillance of healthcare associated infection. The aim is to develop models that can serve as the basis for a sustainable Indian national network for standardised implementation, strengthening, and reporting of healthcare associated infections and infection prevention and control practices for the purposes of public health action.

In the current collaborations, a phased approach is being used to implement healthcare associated infection surveillance that is tied to strengthening related infection prevention and control practices and characterisation of resistance patterns among these infections. The expertise at facilities that are already conducting systematic surveillance of healthcare associated infections, such as the Jai Prakash Narayan Apex Trauma Centre of the All India Institute of Medical Sciences, has been used to develop protocols that will be applied across all network sites. The use of laboratory based standardised

surveillance case definitions, modified from the National Healthcare Safety Network, and the training of facility staff on standardised methods to determine cases, follow clinical and laboratory outcomes, and measure denominators have been implemented to ensure consistent, high quality data. These data will be used to provide standard measures of the incidence of healthcare associated infections (for example, number of central line associated blood stream infections identified/1000 central line days) that can be pooled and compared across sites. Surveillance, which in the Indian Council of Medical Research network is coordinated by the All India Institute of Medical Sciences, has been started in the medical, surgical, and paediatric intensive care units of 20 network sites and will be further expanded in the coming year. Importantly, healthcare associated infection surveillance data will provide estimates of the resistant pathogens among these infections.

Surveillance also includes standardised assessments of infection prevention and control practices for insertion and maintenance of devices. For example, site visits that focused on the use of central lines in intensive care units have shown that infection prevention and control practices differ considerably and are affected by widely varying characteristics of the institutions, including the availability of clinical supplies and whether patients' families have to buy the supplies for device insertion. Information collected from site assessments, together with the input of clinicians, microbiologists, and infection control staff on the wards, have been used to develop and introduce a context appropriate bundle for central line insertion and maintenance for which adherence can be assessed, measured, and reported. Surveillance data will be used to monitor the progress and effect of these interventions.

Strengthening broader institutional capacity for infection prevention and control is also a priority. Each network facility has completed a self assessment using a standardised World Health Organization tool to collect information on the core components of infection prevention and control, such as administrative and staff support and laboratory and monitoring capacity.³³ Data suggest a need for additional capacity building of infection prevention and control staff, which is a main goal of the networks. Training efforts will use and expand on existing programmes to strengthen knowledge and practice of infection prevention and control among healthcare professionals. The development of trained teams of infection control staff will not

only support improved and sustained implementation of infection prevention and control interventions and healthcare associated infection surveillance, but can also enable better detection of, and response to, potential outbreaks of healthcare associated infections. These professionals will further link efforts on healthcare associated infections and infection prevention and control with broader antimicrobial stewardship and AMR surveillance programmes.³⁴

Way forward

Tackling AMR requires a multipronged effort. Healthcare associated infections and infection control are linked with other factors associated with the emergence of AMR. Inadequate infection prevention and control practices provide greater opportunities for new drug resistant infections to emerge in healthcare settings. In turn, a high incidence of such infections results in an increased demand for broad spectrum and reserve antibiotics, which also contributes to increased drug resistance. This inter-relation highlights the importance of strengthening infection prevention and control systems to control AMR.¹³

The newly introduced activities for surveillance of healthcare associated infection and strengthening infection prevention and control are currently being conducted in a limited number of referral hospitals. As the AMR networks of the National Centre for Disease Control and the Indian Council of Medical Research expand these activities will be the basis of more robust and representative national surveillance of healthcare associated infections in public and private sector healthcare facilities across India. The data can be used to develop benchmarks for healthcare associated infections for India and to promote standardised reporting of healthcare associated infections from more healthcare facilities.³⁵ In addition, there is scope to adapt these measures to establish and implement infection prevention and control programmes in regional and district hospitals in semi-urban and rural settings, where it is equally important to understand the burden and pattern of AMR.

Surveillance of healthcare associated infections and infection prevention and control programmes not only help tackle AMR but also contribute to overall patient safety.³⁶ Incorporating the initiatives started by the Indian Council of Medical Research and the National Centre for Disease Control within broader clinical care and patient safety initiatives—including accreditation and certification programmes implemented by the National Accreditation Board of Hospitals and the National Health Mission in

India—provides a way to sustain surveillance of healthcare associated infections and infection prevention and control programmes as a routine part of clinical care. Data from many countries have shown that when governments and health system leaders take a leadership role in prioritising healthcare associated infection surveillance and infection prevention and control efforts, major change can be achieved.¹³ The models developed and lessons learnt in implementation and expansion of healthcare associated infection surveillance and infection prevention and control capacity building in India apply to other countries in South East Asia that also have a mix of public and private sector facilities, higher capacity referral centres in urban areas, and a large number of resource constrained healthcare facilities in both urban and rural areas. The implementation of systematic healthcare associated infection surveillance and infection prevention and control activities, in combination with efforts to generate and report accurate AMR data and enhance antimicrobial stewardship practices, will improve the detection and prevention of AMR in India and other countries in the region.

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Neil Gupta, medical officer⁶

Kayla Laserson, country director, CDC India⁷

Paul Malpiedi, epidemiologist⁶

Anoop Velayudhan, public health specialist, CDC India⁷

Benjamin Park, chief⁶

Padmini Srikantiah, senior medical epidemiologist, CDC India⁷

¹Indian Council of Medical Research, Ministry of Health and Family Welfare, New Delhi, India

²Directorate General Health Services, Ministry of Health and Family Welfare, New Delhi, India

³National Centre for Disease Control, India, Directorate General Health Services, Ministry of Health and Family Welfare, Delhi, India

⁴All India Institute of Medical Sciences, New Delhi, India

⁵Jai Prakash Narayan Apex Trauma Centre, All India Institute of Medical Sciences, New Delhi, India

⁶International Infection Control Program, Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, US Centers for Disease Control and Prevention, Atlanta, USA

⁷Division of Global Health Protection, Center for Global Health, US Centers for Disease Control and Prevention, Atlanta, USA

⁸Global Disease Detection Program, Centers for Disease Control and Prevention, India Office, New Delhi, India

Correspondence to: P Srikantiah
pks6@cdc.gov

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