INNOVATIVE APPROACHES TO ADDRESSING AMR IN HUMANS

Dilip Nathwani
The 10 ‘hot destinations’ named by The Wall Street Journal are:

1. Faroe Islands
2. Puebla, Mexico
3. Kuelap, Peru
4. Minneapolis
5. Dundee
6. Grenada
7. Madagascar
8. Montenegro
9. Shanghai
10. La Rioja, Spain
“Cutting the deficit by gutting our investment in innovation and education is like lightening an overloaded airplane by removing its engine. It may make you feel like you’re flying at first, but it won’t take long before you feel the impact.”

- Barack Obama
INNOVATION OPPORTUNITIES IN AMR
‘INNOVATION’
– A BROAD AND ILL-DEFINED TERM!

IMPROVED HEALTH AND WELL-BEING

IMPACT

ECONOMIC GROWTH
“Think globally but act locally’
Local flexibility while exploiting the benefits of global integration and efficiencies, as well as ensuring worldwide diffusion of innovation
‘Glocalization’ tries to optimise the ‘balance’ between standardization and adaptation of the firm’s international marketing activities
The 9 Rules of INNOVATION

1. Innovation is never a single event. And can be disruptive.

2. Innovation IS combination.

3. First, ask the right question.

4. There is NO optimal size for innovation.

5. Leverage open innovation to expand your capabilities.

6. Disruptive innovation requires new business models.

7. Innovate the core. The 70-20-10 rule.
   - 70% improving existing technology
   - 20% adjacent markets
   - 10% completely new markets

8. In the digital age, we need to use platforms to access ecosystems.

9. Collaboration is the new competitive advantage.
In 2014, Ebola broke out in west Africa, eventually killing over 11,000 people. In the midst of the outbreak, USAID launched the Fighting Ebola Grand Challenge to support the rapid development of a number of cost-effective solutions to apply to the current and future outbreaks. One of the winning submissions, out of 15,000 suggestions, was a protective suit for health workers.\textsuperscript{52}

A Liberian nurse puts on protective clothing before entering an Ebola ward.
The new suit features a number of improvements on existing models, notably better ventilation, meaning that health workers can work for much longer in hot conditions. It is also much easier to put on and take off, reducing opportunities for error. Alongside crowdsourcing a number of ideas, the prize enabled collaborations between universities and industry, for example between Du Pont and John Hopkins University for the production of the protective suit.
The 9 Rules of INNOVATION

1. Innovation is never a single event and can be disruptive.

2. Innovation is a combination.

3. First, ask the right question.

4. There is no optimal size for innovation.

5. Leverage open innovation to expand your capabilities.

6. Disruptive innovation requires new business models.

7. Innovate the core.
   - The 70-20-10 rule: Focus your resources on:
     - 70% improving existing technology
     - 20% adjacent markets
     - 10% completely new markets

8. In the digital age, we need to use platforms to access ecosystems.

9. Collaboration is the new competitive advantage.
eHealth is the cost-effective and secure use of information and communications technologies in support of health-related fields,

- including health-care services
- health surveillance
- health literature & news
- health education, knowledge and research

- (World Health Organization, Ninth plenary meeting, 25 May 2005 - Committee A, seventh report)
IMPROVING SURVEILLANCE OF RESISTANCE
ABCloud Reporting Data: Map of Antimicrobial Resistance in Russia
ResistanceMap

ResistanceMap is an interactive collection of charts and maps that summarize national and subnational data on antimicrobial use and resistance worldwide.

Start exploring the data by selecting a category below. 

Antibiotic Resistance
Choose a pathogen and compare resistance to different antibiotics across countries. World map, in-country trends over time, and charts to compare between countries.

Antibiotic Use
Compare use rates between countries and over time. World map, charts, and breakdowns by antibiotic class.

Explore by Country
Focus on a single country and explore maps and charts on either antibiotic use or antibiotic resistance. Sub-national data is available for the United States.

About Resmap
ResistanceMap is a collection of tools summarizing national and subnational data on antimicrobial use and resistance around the world. Since its launch in 2010, ResistanceMap has helped inform researchers, policy makers and the public of important trends in drug resistance and antibiotic use. In 2015, ResistanceMap re-launched with a new design interface, expanded tools and the addition of antibiotic use and resistance data from several low- and middle-income countries in Africa, Asia and South America. Learn more here.

About CDDEP
The Center for Disease Dynamics, Economics & Policy (CDDEP) produces independent, multidisciplinary research to advance the health and wellbeing of human populations in the United States and around the world. For more information, visit CDDEP's main website.
No reliable Data
QUALITATIVE ASSESSMENT OF DATA

N = 53 C (countries)
N = 335 H (hospitals)
WHO Methodology for Point Prevalence Survey on Antibiotic Use in Hospitals 2017

N = 53 C (countries)
N = 335 H (hospitals)
Antibiotic quality indicators for treatment of GNB infections in adult wards, by region

<table>
<thead>
<tr>
<th>Region</th>
<th>No guidelines (%)</th>
<th>compliant to guidelines (%)</th>
<th>Reason in notes (%)</th>
<th>Stop review date documented (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Europe (n=71)</td>
<td>0</td>
<td>94.4</td>
<td>95.8</td>
<td>62.0</td>
</tr>
<tr>
<td>North Europe (n=46)</td>
<td>10.9</td>
<td>90.2</td>
<td>91.3</td>
<td>60.9</td>
</tr>
<tr>
<td>South Europe (n=254)</td>
<td>24.4</td>
<td>86.0</td>
<td>68.1</td>
<td>37.0</td>
</tr>
<tr>
<td>West Europe (n=314)</td>
<td>9.6</td>
<td>87.4</td>
<td>89.2</td>
<td>43.6</td>
</tr>
<tr>
<td>Africa (n=22)</td>
<td>40.9</td>
<td>100</td>
<td>90.9</td>
<td>27.3</td>
</tr>
<tr>
<td>East &amp; South Asia (n=247)</td>
<td>11.7</td>
<td>92.6</td>
<td>95.5</td>
<td>71.3</td>
</tr>
<tr>
<td>Australia &amp; New Zealand (n=59)</td>
<td>10.2</td>
<td>94.3</td>
<td>94.9</td>
<td>42.4</td>
</tr>
<tr>
<td>West &amp; Central Asia (n=127)</td>
<td>39.4</td>
<td>86.4</td>
<td>76.4</td>
<td>32.3</td>
</tr>
<tr>
<td>South America (n=211)</td>
<td>17.1</td>
<td>78.5</td>
<td>95.7</td>
<td>44.5</td>
</tr>
<tr>
<td>North America (n=61)</td>
<td>42.6</td>
<td>100</td>
<td>96.7</td>
<td>44.3</td>
</tr>
<tr>
<td><strong>Total Gram neg (n=1,412)</strong></td>
<td><strong>17.9</strong></td>
<td><strong>88.2</strong></td>
<td><strong>87.3</strong></td>
<td><strong>47.6</strong></td>
</tr>
<tr>
<td><strong>Total for therapeutic use (n=30,691)</strong></td>
<td><strong>17.7</strong></td>
<td><strong>80.3</strong></td>
<td><strong>85.5</strong></td>
<td><strong>38.0</strong></td>
</tr>
</tbody>
</table>
THE INNOVATION JOURNEY

industrial age

information age

connected age

Krebs Cycle of Creativity
Non Oxman, January 2015

Perception & Culture

Art

Science

Behavior

Design

Production & Culture

Production & Nature

Culture → Nature

Perspective

Information

Philosophy

Economy

Knowledge

Utility

Engineering

Perception

Production & Nature
**Disruptive innovation: a new era in health**

Disruptive innovation and technologies will create new ways of delivering effective healthcare that will overcome acute shortages of both capital and skills.

#megatrends  www.pwc.co.uk/megatrends

---

### Waves of Digital Disruption

- **1995+**
  - Music
  - Photography
  - Video Rental
  - [...]

- **2010+**
  - Print Media
  - TV
  - Travel
  - HR
  - [...]

- **2015+**
  - Banking
  - Healthcare
  - Automotive
  - Retail
  - Education
  - Telco
  - [...]

- **2020+**
  - All Safe havens will be subject to digital disruption
  - [...]

DearMedia,
of mobile internet adoption – infrastructure, affordability, consumer readiness and content.
WHO DEFINITION OF EHEALTH

"eHealth is the cost-effective and secure use of information and communications technologies in support of health-related fields,

• including health-care services
• health surveillance
• health literature & news
• health education, knowledge and research"

- (World Health Organization, Ninth plenary meeting, 25 May 2005 - Committee A, seventh report)
THE CNN EFFECT

Coverage of the first Gulf War and other crises of the early 1990s led officials at the Pentagon to coin the term “the CNN effect” to describe the perceived impact of real time, 24-hour news coverage on decision-making processes of the American government.

THE IMPACT OF A FASTER NEWS CYCLE ON POLITICS, AND THE PRESENTATION OF THE NEWS

- CNN became a powerful medium for change globally, and as said in the above regarding the changes it now faces, the political view was that at the time it perhaps might have had too much power, and it is now the aim to become more balanced. However, it is important to recognise what an important part CNN played in steering change on the political playing field too.

- Key events where CNN played a changing role are: The Cold War, 1989 Tiananmen Square Protests (http://topics.cnn.com/topics/tiananmen_square), and The First Gulf War to name a few.
EUROPEAN OFFICIALS ESTABLISH INDICATORS FOR PROGRESS ON AMR

Uganda confirms 2nd Marburg case, isolates 2 others

Lisa Schnirring | Oct 27, 2017

The man, who died from his infection, is a brother of the first confirmed case-patient.

Antibiotics, EDs linked to community C diff infections

Chris Dell | News Reporter | CIDRAP News | Oct 26, 2017

The data show emergency department visits, among other factors, increase C difficile risk.
The CIDRAP Antimicrobial Stewardship Project (CIDRAP-ASP)

The Center for Infectious Disease Research and Policy (CIDRAP) at the University of Minnesota launched the CIDRAP-ASP in July 2016. The site offers high-quality information and educational resources on antimicrobial stewardship practice, research, and policy, including:

- Podcasts and webinars with subject matter experts
- Targeted policy analyses
- Extensive and up-to-date bibliographies and resource lists
- News stories about antimicrobial resistance and stewardship
- A weekly newsletter and an engaged online community of antimicrobial stewards

Web site: http://cidrap.umn.edu/asp  |  Twitter: @CIDRAP_ASP
Global Antimicrobial Stewardship: Knowledge Transfer Platform

- Commercial Resource
- Non-commercial resource
- Information/NEWS/webinars/podcasts
- Impact, Social media platform/analytics
- IMPACT METRICS

Pharma, vaccines, diagnostics, innovative medicines, Health economics & HTA, R&D

Academia, Healthcare professionals, policy makers, public, media

Quality assessed Single Platform for news and educational resource for stewardship
This toolkit is here to help clinicians and commissioners to use antibiotics responsibility and meet CQC requirements.
## TARGET Prescribing Series

**DESCRIPTION OF RESOURCE [1.1-1.10]**

1.2 Web based or e-learning unfacilitated course [e.g. online module]

**SOURCE OF RESOURCE & COUNTRY OF ORIGIN**

British Society for Antimicrobial Chemotherapy and Public Health England, UK

**ANTICIPATED DURATION [7.1-7.3]**

7.3 Self-paced

**ACCESS [8.1-8.2]**

8.1 Free

**TOPIC: GENERAL AMR FOCUS**

Yes

**REUSABLE LEARNING / TEACHING RESOURCE THAT IS DOWNLOADABLE**

Yes

**TOPIC: AMR WITH PRIME FOCUS ON PRESCRIBING [5.1-5-6]**

5.1 Principles/practice of prudent antibiotic/antimicrobial prescribing

**APPLICABILITY**

6.1 High-resource setting

**LANGUAGES OTHER THAN ENGLISH**

None

**AVAILABLE ACCREDITATION / CERTIFICATION / CREDIT BEARING [10.1-10.6]**

10.3 CME-accredited
Measuring Impact

Altmetrics: Data Aggregators

(Melero, 2015)
Live as if you were to die tomorrow. Learn as if you were to live forever

- Mahatma Gandhi
Many health systems worldwide experience a crippling shortage in the health-care workforce.

In 2006, WHO estimated the shortage in the global health-care workforce to be approximately 4.3 million.

The shortage of adequately trained health-care workers is aggravated by an outward migration of the health-care workforce.

Traditional modes of education are limited by an even greater shortage of teachers and lecturers for different aspects of health professional education, from bedside teaching to foundations of health sciences.

Health professional educational institutions worldwide are thus seeking to innovate in order to respond better to this need to improve, make more efficient and standardize teaching and learning.

Information and communication technology (ICT) offers promising new modes for the delivery of education - called eLearning when used on its own, or blended learning when used in combination with traditional educational methods.

eLearning and blended learning allow for the combination of hands-on, skills-based training as well as self-directed, knowledge-based learning. Both may:
- help reduce the costs associated with delivering educational content;
- facilitate the development and scalability of educational interventions;
- break down the geographical and temporal barriers that limit the access to, and availability of, education;
- improve access to relevant experts and novel curricula;
- allow for personalization of eLearning based on learner behaviour;
E-LEARNING: HIGH IMPACT, LOW COST, WORK OR HOME BASED

- eLearning and blended learning allow for the combination of hands-on, skills-based training as well as self-directed, knowledge-based learning. Both may:
  - Help reduce the costs associated with delivering educational content
  - Facilitate the development and scalability of educational interventions
  - Break down the geographical and temporal barriers that limit the access to, and availability of, education
  - Improve access to relevant experts and novel curricula
  - Allow for personalisation of e-learning based on learner behaviour
  - Facilitate ‘immersive learning’ through augmented reality and 3D learning environments and ubiquitous learning through mobile learning and cloud learning environments

BLENDED LEARNING - ADDED VALUE

Blended learning appears to have a consistent positive effect in comparison with no intervention, and to be more effective than or at least as effective as non-blended instruction for knowledge acquisition in health professions. Due to the large heterogeneity, the conclusion should be treated with caution.

RADICAL HEALTHCARE INNOVATION IS CROPPING UP DIFFERENTLY IN KEY MARKETS, WITH IMPORTANT ECONOMIC FACTORS DRIVING ENTREPRENEURIAL OPPORTUNITY

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>India</th>
<th>Kenya</th>
<th>Mexico</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>202 million</td>
<td>1.2 billion</td>
<td>45 million</td>
<td>123 million</td>
<td>318 million</td>
</tr>
<tr>
<td>GNI (per capita, PPP)</td>
<td>$15,900</td>
<td>$5,760</td>
<td>$2,890</td>
<td>$16,160</td>
<td>$55,860</td>
</tr>
<tr>
<td>Nurses (per 1K people)</td>
<td>7.6</td>
<td>1.7</td>
<td>0.9</td>
<td>2.5</td>
<td>9.8</td>
</tr>
<tr>
<td>Internet users (per 100 people)</td>
<td>57.6%</td>
<td>18%</td>
<td>43.3%</td>
<td>44.4%</td>
<td>87.4%</td>
</tr>
<tr>
<td>Rural Population</td>
<td>15%</td>
<td>68%</td>
<td>75%</td>
<td>21%</td>
<td>19%</td>
</tr>
<tr>
<td>Health expenditure, total (%) of GDP</td>
<td>9.7</td>
<td>4.0</td>
<td>4.5</td>
<td>6.2</td>
<td>17.1</td>
</tr>
<tr>
<td>Out-of-pocket health expenditure (% of total expenditure on health)</td>
<td>29.9%</td>
<td>58.2%</td>
<td>44.6%</td>
<td>44.1%</td>
<td>11.8%</td>
</tr>
</tbody>
</table>
ICT TOOLS ARE WIDELY USED IN SECONDARY EDUCATION, BUT ONLY SINGAPORE AND KOREA DO IT IN AN INTEGRATED WAY.

SAMPLE OF ICT TOOLS IN SECONDARY EDUCATION – NON EXHAUSTIVE

<table>
<thead>
<tr>
<th>INDIA</th>
<th>CHINA</th>
<th>BRAZIL</th>
<th>RUSSIA</th>
<th>SINGAPORE</th>
<th>KOREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio Programs</td>
<td>Computer Labs</td>
<td>Shared elearning platforms</td>
<td>Information Services</td>
<td>Open source &amp; open contents Information Services</td>
<td>Whiteboards</td>
</tr>
<tr>
<td>Computer Assisted Learning Centers</td>
<td>Broadcast -ing via Satellite</td>
<td>TV School</td>
<td>Computer Radio</td>
<td>Persona -ised learning devices</td>
<td>Digital Textbooks</td>
</tr>
<tr>
<td>Multi-media CD's</td>
<td>Online Course Warehouse</td>
<td>Digital Library</td>
<td>elearning platforms</td>
<td>Interactive software and digital content</td>
<td>Digital Library</td>
</tr>
<tr>
<td>Village Telecentres/Kiosks</td>
<td>Distant education programs</td>
<td>Educational Software</td>
<td>Computer on Wheels</td>
<td>gaming, program -ming tools, 3D Modelling &amp; animation</td>
<td>Cyber Home Learning Content</td>
</tr>
<tr>
<td>Computer on Wheels</td>
<td>Multimedia</td>
<td>Computer Labs</td>
<td>Computer Labs</td>
<td>Web 2.0</td>
<td>Web 2.0 based integrated Education Information services for student, teacher &amp; parents</td>
</tr>
</tbody>
</table>
Learning outcomes are statements of what a student is expected to know, understand and/or be able to demonstrate after completion of a process of learning.
**MOOC Providers**

- **Coursera**: The largest and most well known MOOC provider; entrepreneurial and building a global presence.
- **edX**: Originally a MOOC provider for the elite universities, now in partnership with Google in mooc.org.
- **Udacity**: Most promising business model with emphasis on technology courses and job placement.
- **FutureLearn** and **open2study**: Regional MOOC providers for the UK and Australia.
- **Khan Academy**, **Alison**, **edX**, **Udemy**: These “MOOC-like” providers also exist.

*Lessons from MOOC-Based Education*  
eLearnz 2015 Conference
MOOCs: GARTNER HYPE CYCLE

- **Technology Trigger**
- **Peak of Inflated Expectations**
  - 2012: The year of MOOCs
  - 2013: Negative news appears
- **Plateau of Productivity**
- **Slope of Enlightenment**
  - What works?
FUTURELEARN OVERVIEW

FutureLearn is strongly differentiated from the competition

1. Representing UK higher education, the global number two HE brand, with 435K non-UK students at UK universities and an export value of £7.9bn.

2. Cross-party support in England, Wales, Scotland and Northern Ireland and from within the higher education sector.

3. Participation of 17 elite UK universities, the British Library and British Council, with more partners in discussion.

4. Hosted by The Open University, a global leader in online and distance education for 44 years, bringing a focus on student experience.

5. Focus on employability, with clear pathways into accredited learning.

Speaking from India
Prime Minister David Cameron said:

"Britain boasts some of the best universities in the world. This innovative new offer led by The Open University will mean that Indian students can access some of the best teaching and learning online from their home in Mumbai or Delhi."
ANTIMICROBIAL STEWARDSHIP MOOC

Total MOOC Enrolments since September 2015: 42,140

Participants from countries across the globe, based on 21,232 known joiner locations:
- North America: 6%
- South America: 5%
- Africa: 13%
- Europe: 49%
- Asia: 16%
- Australia: 8%

POST COURSE SURVEY RESULTS COMBINED FOR ALL FIVE RUNS:

- 80% Strongly liked the discussion between subject experts
- 89% Found the course engaging or very engaging
- 75% Found the course the right length
- 84% Did the course at home
- 95% Course met or exceeded their expectations about learning about the subject
- 64% Met or exceeded their expectations about improving their career prospects
- 95% Met or exceeded their overall expectations
- 59% Were healthcare workers
- 87% Met or exceeded expectations about adding a fresh perspective to their role
- 88% Said Excellent or good to the question: How would you rate the course?
I thoroughly enjoyed this course. I have learnt so much and continue to learn from the articles and documents posted. I have spread the word at the Hospital where I work about this course. I am sure there will be other persons joining the course in the future. A big thankyou to all the facilitators and participants for all the discussions and feedback. I particularly enjoyed the sections on behavioural change. Finally, our newly formed AMS group has been given a wealth of information, strategies and tools to help make it a success in my country.

The course was excellent! The quality of its content, the availability of teachers, the comprehensiveness of the problem. The didactic way it was conducted, the simple way to present complex content of some topics. What a fantastic course! Many thanks to Professor Nathwani, all the educators, and to everyone who participated. Wishing everyone much success on their antimicrobial stewardship journey.

Thank you for an excellent course. It has really brought my knowledge up to date about antimicrobial stewardship. I particularly liked the behaviour change as this is an element that is often overlooked.

I cannot believe this course is available for free, it is one of the most useful, practical courses I’ve ever been involved in and has left me feeling inspired and equipped with new skills and confidence to act on that inspiration. Thank you to all the educators for your passion and generosity.

I would like to express my pure gratitude to Professor Nathwani and his whole Team for delivering this wonderful ABS course which actually did meet the highest standards of online interactive education.

Thank you for an extremely enlightening and useful course. I have thoroughly enjoyed the global collaborative learning environment which has definitely provided me with a series of additional considerations for my own environment.
Google partners with EdX to plan MOOC.ORG

EdX Announces Partnership with Google to Expand Open Source Platform

Google will collaborate with edX on MOOC.org, new destination and hosting site for online learning.

Cambridge, MA - Sept. 10, 2013 - Edx, the not-for-profit online learning initiative, today announced its partnership with Google to jointly develop the edX open source learning platform, Open edx, and expand the availability of the platform and its learning tools to individuals and institutions around the world. In collaboration with Google, edX will build out and operate MOOC.org, a new site for non-xConsortium universities, institutions, businesses, governments and teachers to build and host their courses for a global audience. This site will be powered by the jointly developed Open edx platform.

- EdX already “working with” Knewton, Cambridge and Pearson Publishing, ....
- EdX positioned as Google’s LMS, to complement Apps offerings
- EdX leverage’s Google’s cloud scale
- EdX grows its already rich collaboration on content and analytics

3 Reasons Why the EdX / Google Partnership Is Big News

September 17, 2013 - 9:00pm
By Joshua Kim

Like many of you, I've been trying to get my head around the announcement that edX and Google (https://code.google.com/p/course-builder/) are entering.

How big a deal is this partnership for higher ed?

I had the opportunity to chat with edX's marketing and communications team, and I think that I have so Google partnership is important news.

Reason #1 - Google's Learning Platform Decision:

Google has been developing its Course Builder (https://code.google.com/p/course-builder/) platform!

From here on out, Google will share Course Builder in maintenance mode, and devote resources and inf...
SPOOCs - SMALL, PRIVATE ONLINE COURSES

“The MOOC Moment”

Inside Higher Ed

MOOC VS. LOOC

Free

Free

BUSINESS

Harvard plans to boldly go with 'Spocs'

By Sean Coughlan
BBC News education correspondent

Keep up, keep up. If you've only just caught on to the concept of online university courses called Moocs, then you're in danger of falling behind again.

Harvard, one of the world's most influential universities, is moving on to Spocs - which stands for small private online courses. Nothing to do with Star Trek and sombre Vulcans, but plenty to do with ambitions to boldly go.

Student Persistence in One MOOC: BI

Registered

Watched at least one video

Took any quiz during the course

Scored ≥0 on both Week 1 quizzes

Scored ≥0 on either quiz in Week 4

Attempted the final exam

Earned a certificate

Earned a distinction certificate

By Laura Krouse

Source: Duke Center for Instructional Technology
AFRICAN STEWARDSHIP MOOC
NURSES + IPC + WASH 2018

FREE BRITISH SOCIETY FOR ANTIMICROBIAL CHEMOTHERAPY COURSES

CHALLENGES IN ANTIBIOTIC RESISTANCE: GRAM NEGATIVE BACTERIA
THE BRITISH SOCIETY FOR ANTIMICROBIAL CHEMOTHERAPY

This course by BSAC is for healthcare professionals managing infections. You will learn about Gram Negative Bacteria.

📅 3 Apr ⏰ 3 weeks ⏰ 3 hours pw ⚡ Certificate

CHALLENGES IN ANTIBIOTIC RESISTANCE: POINT PREVALENCE SURVEYS
THE BRITISH SOCIETY FOR ANTIMICROBIAL CHEMOTHERAPY

Learn how to use Point Prevalence Surveys (PPS) to measure antibiotic consumption and fight antimicrobial resistance.

📅 1 May ⏰ 2 weeks ⏰ 2 hours pw ⚡ Certificate
The African Digital Frontier

INTERNET PENETRATION PERCENTAGE BY REGION

- North America: 77.4%
- Oceania/Australia: 65.3%
- Europe: 59.5%
- Latin America/Caribbean: 21.8%
- Africa: 10.4%

The four largest mobile phone markets are Nigeria, South Africa, Kenya, and Ghana.

The largest fixed-line broadband market is South Africa, followed by Egypt, Morocco, Algeria, and Tunisia.

International Internet Usage

1. People's Republic of China
2. India
3. Indonesia
4. Brazil
5. Russia
6. Pakistan
7. Pakistan
8. Nigeria
9. South Africa
10. United Arab Emirates

In 2009, there were 17 million Facebook subscribers to 305.5 million Facebook users on the African continent, expanding to 2.54 billion by 2011.

84% cell phone ownership in emerging and developing nations.

MORE COOLNESS? #ODMACT @oglvldma

Infographic designed by @fiascoawesome
OPPORTUNITY FOR LOW COST, HIGH IMPACT SOLUTIONS

Bulletin of the World Health Organization

E-health in low- and middle-income countries: findings from the Center for Health Market Innovations

Fig. 2. Technology-enabled programmes, by region

Fig. 3. Technology-enabled programmes, by health focus

Source: Center for Health Market Innovations. AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus.
HealthMap is a platform that uses online sources to monitor the outbreak of diseases. Developed by a team of researchers at Boston's Children's Hospital in 2006, the website and app bring together data from online news aggregators and social media platforms to produce real-time intelligence on the current global state of infectious diseases. A notable early example of the use of HealthMap was in tracking cholera in Haiti after the 2010 earthquake. The real-time nature of the platform represented a significant advance in intelligence, as subsequent analysis confirmed significant correlation between the picture provided by HealthMap and the picture provided by official data from health agencies - the difference being that official case data was typically not available until two weeks after the first outbreak.²¹
The launch of the PHC Clinical Guide app is seen as the first step toward the effective dissemination and implementation of the Standard Treatment guidelines and promoting rational medicine use.

The Solution

The launch of the PHC Clinical Guide app is seen as the first step toward the effective dissemination and implementation of the revised guidelines and promoting rational medicine use. “This is merely the dawn, not event, as we embrace technology to leverage the potential of the STG’s and EML”, said Mr Gavin Steel, Cluster Manager:Sector Wide Procurement, NDoH.

The app is for all categories of healthcare professionals and healthcare workers in Primary Healthcare. These guidelines address clinical and programmatic aspects of primary healthcare treatment and prevention amongst adults.

We use mobile technology and the reach it grants us to disseminate life-saving information, in the best format, to where it’s needed the most.

150 000 Empowered
Over 150 000 healthcare workers have been empowered all over the world.

200 Countries
Our technology and solutions are used in over 200 countries worldwide.

3 400 000 Accessed
Through our apps, health-care information has been accessed over 3,400,000 times.

READ ABOUT OUR PROJECTS
A good example of TOMPSA’s work is the PHC Clinical Guide App, launched in 2015. Access to safe and effective medicines in South Africa has been improved through the production since 1996 of peer-reviewed Standard Treatment Guidelines (STGs) and Essential Medicine Lists (EMLs). However, the fact that the lists are produced every three years means that they can quickly become outdated, with healthcare workers often lacking access to the latest versions. The PHC Clinical Guide app, addressing a need identified in co-design workshops with frontline health practitioners, makes the STGs/EMLs accessible through a free mobile app, which is immediately updated with new information and medicines ratified by the review process. The app is already being used by around 10,000 clinicians, and has been downloaded in 56 countries besides South Africa.
http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002411
Fig 1. Schematic representation of the e-POC algorithm.


What did the researchers do and find?

▶ In a randomized trial in Dar es Salaam, Tanzania, we compared the clinical outcomes of 1,586 children under 5 years with acute infections treated using e-POCT with that of 1,583 children treated using the current reference smartphone algorithm (ALMANACH).

▶ We observed that e-POCT improved clinical outcomes while reducing antibiotic prescription from 30% to 11%.

▶ e-POCT better targeted those children truly in need of antibiotic treatment through enhanced identification of children with severe diseases.
THE FEASIBILITY OF USING ‘BRING YOUR OWN DEVICE’ (BYOD) TECHNOLOGY FOR ELECTRONIC DATA CAPTURE IN MULTICENTRE MEDICAL AUDIT AND RESEARCH

Options for data collection

- Traditional method
  - Paper form
  - Electronic entry
  - Central database

- Mobile electronic data collection
  - Mobile device
  - Central database

Corporate devices
Bring your own device

Anaesthesia
Volume 71, Issue 1, pages 58-66, 3 NOV 2015 DOI: 10.1111/anae.13268
THE FEASIBILITY OF USING ‘BRING YOUR OWN DEVICE’ (BYOD) TECHNOLOGY FOR ELECTRONIC DATA CAPTURE IN MULTICENTRE MEDICAL AUDIT AND RESEARCH

Device magic app installed on user device from appropriate app store

Device registered via central control panel and data collection form is pushed to device

Data collected on device using data collection form with conditional logic and data validation

If no data connectivity, data retained on device in sandboxed area

When data connectivity available, data securely transmitted from device to central server

Data removed from device after transmission

Central server saves data to central database

Instant data back-ups for data safety

Anaesthesia
Volume 71, Issue 1, pages 58-66, 3 NOV 2015 DOI: 10.1111/anae.13268
Main screen offers access to guidelines, calculators, alert policy and other useful information.

Search and Menu buttons

Vancomycin calculator

NEW CAPACITY FOR REAL TIME AUDIT DATA BEING INCORPORATED
Measuring Antibiotic review: the challenge
Quality indicator data collection via the
Antimicrobial Companion app audit tool

Please make one submission per infection episode

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication documented in the medical notes?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment compliant with policy?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only oral antibiotics prescribed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV or combination (IV and oral) antibiotics prescribed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbapenem prescribed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All prescribed IV or combination doses administered?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical review within 72 hours documented?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, what was the documented outcome?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comments</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Using a Mobile Application to evaluate and support improved antimicrobial stewardship practice

BACKGROUND

- The use of mobile applications “apps” in healthcare is increasingly common.
- In 2017 The Scottish Antimicrobial Prescribing Group (SAPG) implemented a decision support app to aid clinical antimicrobial decision-making, including gentamicin and vancomycin calculators, and prescribing guidance.
- A novel aspect of the SAPG app is incorporation of an audit tool for collecting prescribing quality indicator data for local improvement and national reporting.
- The few studies in the literature of using mobile technology for clinical audit reported enhanced data completion and quality but none were in relation to antimicrobial stewardship.

The aims of this study were to describe the early experience of using the SAPG app in NHS Tayside (NHST) and explore Foundation Year (FY) doctors’ attitudes to mobile technology in relation to stewardship.

METHODS

- The Antimicrobial Stewardship Team (AST) were shadowed collecting quality indicator data, and entering them into the app, from a sample across 4 wards in NHST from August 2017 – October 2018.
- An anonymous SurveyMonkey questionnaire was sent, via email, to all 177 FY doctors in NHST. It contained eight short questions about junior doctors’ willingness to participate in quality improvement projects, their preferred method of data collection, and an estimation of how much time they could commit to data collection.

RESULTS

- Only the AST currently use the SAPG app for audit in NHST.
- This was reported as being due to the need for users to have training and registration, and to provide quality assurance for data collection.
- The frequent movement of FY doctors between units may prevent junior doctors from becoming involved.
- Of 80 patients sampled for data collection, the compliance with quality indicators was:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication for prescription recorded</td>
<td>100%</td>
</tr>
<tr>
<td>Oral Prescriptions: Duration/stop date recorded</td>
<td>42%</td>
</tr>
<tr>
<td>IV/combinations: 72hr review recorded</td>
<td>94%</td>
</tr>
</tbody>
</table>

43 FY1 and 47 FY2 doctors completed the survey. (Overall response rate 50.8%).

<table>
<thead>
<tr>
<th>Statement</th>
<th>Positive Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interested in taking part in quality improvement</td>
<td>92%</td>
</tr>
<tr>
<td>Aware of training requirement to take part in quality improvement</td>
<td>98%</td>
</tr>
<tr>
<td>Has a personal device they are willing to use for work purposes</td>
<td>97%</td>
</tr>
<tr>
<td>For the management of infection, use mobile device for audit/data collection</td>
<td>3%</td>
</tr>
<tr>
<td>Would rather data collection was by a mobile app</td>
<td>57%</td>
</tr>
<tr>
<td>Would spare thirty minutes to be trained in mobile data collection</td>
<td>80%</td>
</tr>
<tr>
<td>Could spare 20–60 minutes on a fortnightly basis for data collection</td>
<td>70%</td>
</tr>
</tbody>
</table>

CONCLUSIONS

- Foundation doctors are willing to take part in the training and audit.
- Participation in SAPG quality indicator collection using the app could be done throughout FY rotations using transferable skills.
- The use of a mobile application for data collection and audit is a novel approach in Antimicrobial Stewardship.
- FY doctors in NHS Tayside already use mobile technology to support their antimicrobial prescribing practice, are willing to engage in audit and quality improvement, and prefer technological to paper methods.

This has potential to be a sustainable and scalable approach to audit and QI for antimicrobial stewardship.

REFERENCES


Contact: helencallaby@nhs.net

Dr Helen Callaby, Professor Dilip Nathwani, Dr Charis Marwick, Dr Busi Mooka, Ms Heather Kennedy
“USERS”
“Jimmy” + “Jock”
“Jake” + “Janice”
+ service providers
+ industry

“TOOL KIT”
Personas
Empathy mapping
Service Journeys
Touchpoints
Sustainability
Ethnography
Asset approach

ENGAGE
EDUCATE
EMPOWER
TECHNICAL SOLUTIONS
NON-TECHNICAL SOLUTIONS
PERSONAL TRAGEDY, COLLECTIVE RESPONSIBILITY

The loss of Susan Fallon’s daughter to antibiotic resistant superbug was the waste of a beautiful young life that could so easily have been avoided.
EXAMPLES OF INNOVATION IN PUBLIC ENGAGEMENT

• PHE’s Keep Antibiotics Working / Antibiotic Guardian campaign

• BSAC’s Antibiotic Action network of champions, partners, and influencers

• BBC Pandemic app (crowdsourcing big data to prevent/control/treat infection – it possesses huge potential)

• The Science Museum’s Superbugs: the fight for our lives public exhibition (which runs from Nov 2017 to spring 2019)

• The Mould that Changed the World (a musical production for school children that celebrates the discovery of penicillin while warning of a post-antibiotic age. It is to be premiered at the National Museum of Scotland, which is home to the Nobel Prize medal awarded to Fleming in 1945). This project is a collaboration between BSAC, Charades Theatre, and the University of Edinburgh
THE MOULD THAT CHANGED THE WORLD
- a primary school musical about antimicrobial resistance

Meghan R. Perry¹,²,³, Jennifer Hall¹, Michael Corley¹, Carolyne Horner¹, Tracey Guise⁴, Robin Hiley⁵
¹Centre for Immunity, Infection and Evolution, University of Edinburgh, ²Centre for Inflammation Research, University of Edinburgh, ³Regional Infectious Diseases Unit, Western General Hospital, Edinburgh, ⁴British Society of Antimicrobial Chemotherapy, Birmingham, ⁵Charades Theatre Company, Edinburgh

THE MOULD THAT CHANGED THE WORLD

Scene 1 - Infectious Disease WWI
The Soldiers - Fleming
Scene 2 - You All Fall Down
The Bacteria - Plague, Staph
Scene 2.1 Infectious Disease Reprise
The Bacteria, Plague, Staph
Scene 2.2 - The Discovery
Fleming, Pryce
Scene 3 - Let’s Clean!
The Scientists - Fleming
Scene 3.1 - The Lancet
Fleming, Pryce, Florey, Chain
Scene 4 - The New Wonder Drug, WWII
The Soldiers, The Bacteria
Scene 5 - The Nobel Prize
The Scientists, The Soldiers - Fleming, Florey, Chain
Scene 6 - Wonder, non-toxic, antibiotic drugs
The Scientists - Fleming
Scene 7 - We Want The Cures
The Doctors, The Patients, The Bacteria - Fleming
Scene 7.1 You All Fall Down Reprise
The Bacteria, Plague
Scene 8 - United Nations General Assembly
Tutti
Seize the Opportunity to innovate
If you want to bring down the prices of healthcare and education, the answer will be more innovation, more technology, which will then have the effect of freaking everybody out and saying, ‘Oh my God, you’re going to kill all the jobs.’

- Marc Andreessen