Pan-Commonwealth Forum, 9-12 September 2019, Edinburgh, Scotland.

Professional Learning to Tackle Global Development Challenges

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Abstract
The UN's Sustainable Development Goals represent a world-wide endeavour to reduce inequality through addressing global challenges. Tackling global challenges requires scaling-up and accelerating professional learning in international development contexts worldwide. The literature on professional learning suggests that conventional forms of workplace learning, such as Training, Continuing Education and Online Learning, enable large numbers of people to reach a specific level of competency. However, this does not take into consideration complicated situations where workplaces have to be adapted continually to address complex global challenges.//

This presentation outlines an empirical study aiming to reduce the global challenge of Antimicrobial Resistance (AMR), the ability of bacteria to become resistant to antibiotics. The study is funded through the UK Government's Fleming Fund. AMR poses a catastrophic threat on a global scale. Drug resistant infections are on the rise with evidence that globally at least 700,000 die annually because of drug resistance. The study identified a range of skills and knowledge gaps in health settings in a low-to-middle-income country. These skills and knowledge can be learned through online and 'blended' learning, integrating online with face-to-face, work-based training. However, learning skills and knowledge in itself is not sufficient to tackle AMR. For capacity building to be effective, skills training has to be accompanied by a reflection on and re-organisation of the work environment. This involves examination of current and future roles and work practices and making necessary adjustments to work processes and practices. //

These findings offer a new perspective on capacity building for global challenges, arguing that professional learning must extend beyond knowledge and skills development, to include reflection on and making adjustments to the work system. These reflections can be supported through a Professional Learning Framework that can be applied generally across work based learning, helping to address a range of International development challenges.// Paper ID 22

Keywords: professional learning, professional development; capacity building, global challenges, international development, technology enhanced learning

1 The global challenge of AMR

The UN's Sustainable Development Goals represent a world-wide endeavour to reduce inequality through addressing global challenges related to poverty and health. A major global challenge is Antimicrobial Resistance (AMR), the ability of bacteria to become resistant to antibiotics. AMR poses a catastrophic threat on a global scale. Drug resistant infections are on the rise with evidence that globally at least 700,000 die annually because of drug resistance. There is need to upskill health professionals in both the human and animal health areas to enable them to learn the latest approaches to working with antibiotics, based on surveillance systems that monitor and act upon AMR, particularly in low to middle income countries (LMICs) where the issue is most challenging.

An important factor in reducing the rate at which bacteria become resistant to antibiotics is the introduction of AMR surveillance systems (O'Neil, 2014). Globally AMR surveillance provides early warning about the spread of new resistant strains of bacteria, illustrating geographic variations in the incidence and prevalence of resistant pathogens and helping to identify long-term trends. A UK government report by O'Neil (2014) identified that good quality AMR data, gathered at a local level, provides a platform for good AMR surveillance. An example from a human health perspective is, at the local level, a patient visits a doctor with an infection. The doctor takes a sample (e.g. urine, blood) and sends it to the hospital lab to be tested. The hospital laboratory performs AMR tests on the sample to provide the clinician with data that is used to diagnose and treat the patient. These data are gathered from a number of hospital labs and are collated for use as regional or national surveillance data. Thus, local data not only helps inform the best treatment and care for an individual patient, but at regional level, these data inform intervention priorities and gaps in service delivery and at a national level, highlights populations

most at risk, thereby guiding planning and resource allocation and informing health policies and responses to patterns and trends.

A recent report identified a number of factors limiting the assimilation of good quality AMR data: insufficient human resources, lack of specialised personnel such as microbiologists, limited workforce capacity, out-of-date education and training, inadequate infrastructure, and insufficient quality, standards, and accreditation (Wilson et al, 2018). These issues sit alongside other problems including a general perception of lab work not being a valued career choice within LMICs, rapidly changing work practices and availability of increasingly sophisticated technology solutions. There is a need to upskill people in involved in AMR surveillance, including lab professionals, however there is a fundamental gap in the provision of opportunities for professional learning in AMR surveillance.

2. Addressing the challenge of AMR through professional learning

The literature on professional learning suggests that conventional forms of workplace learning, such as Training, Continuing Education and Online Learning, enable large numbers of people to reach a specific level of competency. However, this training does not take into consideration complicated situations where workplaces have to be adapted continually to address ongoing changes in work practices, technology solutions and increasingly sophisticated quality monitoring (Littlejohn & Margaryan, 2014). This makes it difficult for professionals to apply the knowledge they learn on a course to a changing work context.

Course design for professional learning usually takes a design perspective, where learning opportunities are designed around learning objectives, then the learning is applied to the workplace. However, the design approach usually does not take into consideration the context of application of knowledge – the workplace. Consideration of the impact of the workplace on learning is vital, since there is growing recognition that there are few situations where professional learning takes place formally, without the addition of informal learning through routine work tasks (Malcolm et al, 2003). Eraut (2011) emphasises the importance of informal (or 'non-formal') learning at work. As professionals learn through routine work tasks, the workplace acts as a site for learning (Boud & Garrick, 1999). Learning and development opportunities, therefore, are situated within the workplace and co-exist with expert practice (Boshuizen, 2004). The workplace context and culture influences and shapes learning, as professionals expand and develop their practice (Fuller & Unwin, 2003).

A study, funded by the Fleming Fund, a UK aid programme, is examining how expand and develop the capacity of professionals to carry out the surveillance of AMR worldwide. AMR surveillance is important, because it provides data at local, national and international levels to support clinicians, vets and agriculture specialists in understanding how best to use antibiotics. This study focuses on low-to-medium-income countries (LMIC), because those countries have the greatest challenges in terms of dealing with AMR. Through interviews with AMR experts followed by field studies, this research prioritised distinct areas of knowledge and identified how these areas of knowledge could be learned by people in specific job roles within particular workplaces.

This work takes a distinctive standpoint than that normally taken for the design of professional learning, by first considering the specific needs of professionals in the workplace, then examining how learning activities can build capacity within these work contexts. The primary aim of the analysis was first to identify knowledge gaps perceived by the lab professionals and second to develop an in-depth understanding of the characteristics of the laboratory setting, to identify the various roles within laboratory settings and trace their working relationships with other health professionals in both human and animal health. We placed particular attention to current forms of work practice in AMR surveillance and forms of professional learning that are already in this context. This approach places the lab professionals at the centre of the design and takes a critical approach to the ways professional learning can add value to their professional lives. In this way, the study is original in examining capacity building for a global challenge by taking a whole system approach, rather than through the development of skills and knowledge for work.

3 Method

Data collection took place in 2018 in two ways. In phase 1 qualitative data was gathered from 23 AMR experts around the world, through semi-structured, skype interviews, each lasting around 1 hour. Phase two involved fieldwork across three countries: one Asian country (called Country A) and two African countries (Country B, Country C). Country A is among the least developed countries in the DAC List of Aid recipients[1] and was

[1] OECD DAC ODA list http://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/daclist.htm

selected because a public health surveillance system was being introduced and, therefore, provided a national context where capacity building would be alongside developments in AMR policies and regulatory mechanisms. Fieldwork included site visits to six laboratories that are part of the Country A's surveillance network: two were national reference laboratories, one national food laboratory and three were sentinel sites. These six sites were distributed across the areas of human health, animal health and agriculture AMR.

Two types of data were gathered at each of these sites. Fieldnotes from guided site observations in each of these six laboratories, comprised of notes and photos of work settings and staff carrying out routine work. These fieldnotes were supplemented with interviews with 25 professionals across these sites (22 individual interviews and one group interview with 3 professionals). Interviewees included laboratory staff, laboratory managers and AMR policy-makers, which were the professional groups we identified as most critical for changing policy and practice in laboratory settings. Each interview lasted 30 to 60 minutes and was guided by a semi-structured instrument previously used in studies of self-regulated, professional learning (Littlejohn et al, 2016). Each interview was audio-recorded and transcribed verbatim prior to analysis.

Thematic analysis of these interview data was carried out using the thematic categorisation method described by Tuomi & Sarajärvi (2009). The interviews were loaded into the analysis software application, NVivo 11. The data were then analysed using the cultural-historical activity theory framework (Engeström, 2015) which was used to pinpoint each 'subject of activity' as well as 'actions' and 'tensions' within the activity. The analysis questioned: "What are key activities organisations/laboratories do?"; "What do individuals say they do"; "What does the practice linked to surveillance look like?"; "What are the perceived challenges in their work?" and "How do individuals say they learn and develop new skills and knowledge in their work?". These questions helped identify a range of challenges associated with professionals' work, articulated during the interviews.

Analysis of these data enabled a thorough mapping of knowledge and skills gaps for AMR surveillance relevant for each professional role (see Charitonos et al., 2018). This was followed by analysis of the tensions between elements of the AMR surveillance activity system at the country level, that were coded drawing on Engeström's method (1987). The latter is of particular importance as it illustrates the work context and identifies issues with ways of working amongst professionals. Drawing on this analysis, the paper highlights problems of surveillance practice in public health settings. Following on from this, we consider forms of learning activities to support lab professionals in learning relevant knowledge and practice and consider how technologies might be used to support this learning in the workplace.

Systemic issues affecting ways of working in AMR surveillance systems and shaping work practice are discussed further in the next section.

4 Findings: Skills and Knowledge gaps

The analysis identified a range of skills and knowledge gaps in health settings in a low-to-middle-income country. The first six categories are specific to AMR surveillance activity and can also be viewed as exclusive to roles within the system. However, the last three categories are distributed across different sectors and roles. Some areas of knowledge and skills align with one or more categories (e.g. Communication, Collaboration & Advocacy and One Health Multisectoral). A typology of knowledge and skills gaps is illustrated in Table 1:

Table 1 Typology of knowledge and skills needed for AMR surveillance

Ref	Category name	Description
1	**Diagnostics Stewardship**	Diagnostics Stewardship refers to the appropriate use of laboratory testing to guide patient treatment, in order to optimize clinical outcomes and limit the spread of AMR (including clinical case definition, demand for appropriate tests, sampling selection - sample & test, Sample-in-transport, and diagnostic information translated into appropriate management of the patient).
2	**Good Laboratory Practice**	Good Lab Practice is a quality system with management controls for laboratories. This system assures the consistency, quality, and integrity of lab tests. It includes resources management (re-agents, supplies, media), biosecurity & biosafety, Quality Control (internal process) SOPs and Quality Assurance (external scheme).

3	**Foundations in Microbiology**	Refers to core knowledge of concepts of microbiology and development of skills around microbiological use of various equipment like microscopes and various dyes and stains and performing many microbiological techniques, e.g. AST, agar diffusion test, bacterial inhibition, microbiological culture. More applicable to the sites/sentinel sites
4	**Molecular Advanced Microbiology**	Molecular Advanced Microbiology refers to core knowledge of biological activities at the molecular level and development of skills around the use of specific techniques unique to molecular biology and genetics or biochemistry e.g. Polymerase chain reaction (PCR). More applicable to the Reference Labs
5	**Data Use & Interpretation for diagnosis in Clinical and Vet Services**	Refers to the activity where individual case-level anonymised data are collected as local health facility data (i.e. sentinel site data) These could include the total number of patient episodes and the total number of samples processed in the laboratory. It also refers to activity where lab diagnostics support treatment of individual patients.
6	**Data Use & interpretation for Public Health Policy**	Refers to the activity where local health facility data (from sentinel sites or surveillance labs) are submitted regularly to national co-ordinators, healthcare / public health administration, clinical and laboratory staff, to support continued engagement with AMR surveillance. Aggregated data in district level; aggregated data at the national level; aggregated data at the global level to inform public health policy.
7	**Communication, Collaboration & Advocacy**	Effective advocacy and communication, education and training, and empowerment and networking can lead to improved data use and sharing, awareness and understanding of antibiotic resistance and can facilitate behaviour change. Could also include report writing.
8	**Surveillance System Planning & Implementation**	Refers to developing surveillance strategy (local, district and national level), surveillance workforce organisation, surveillance management, project management, Fleming grants
9	**One Health Multisectoral**	Refers to the One Health perspective and operationalisation; all sectors, collaboration in the human, and the animal, livestock, fisheries, and other sectors collaborating to achieve a common outcome.

These nine priorities areas were mapped against key roles related to AMR surveillance to support the design of learning approaches (face-to-face, online or 'blended') tailored to specific occupations. Analysis of the data from the field visits identified key challenges associated with learning these skills and applying them within the workplace in laboratory settings in LMIC reference labs and sentinel sites.

5 Findings: Tensions in bridging the skills and knowledge gap to support global challenges

Analysis of the data from the field visits identified tensions that may emerge as laboratory professionals learn new skills and knowledge and apply these to their professional practice. The following section highlights key tensions that were identified.

5.1 Supporting global challenges depends on well-functioning networks

Analysis of the interviews with experts identified that the extent to which a global challenge can be reduced in LMICs depends on how well networks of individual organisations operate together with shared values to provide a functioning infrastructure. These networks include government organisations, NGOs, local facilities. The organisations in these networks have to be resourced, the organisations have to work in a joined-up way and there has to be commitment to a common goal from each organisation.

In most LMICs countries the scale of resourcing in labs varies substantially both trans-nationally, within each country and within sector (animal and human sectors). Typically, labs in rural settings differ from urban areas; the capacity and expertise in AMR reference labs is different from sentinel sites and only a few labs are accredited. A number of systemic issues were identified with day-to-day operation of the labs, including infrastructure problems such as limited power supply, inadequate equipment, insufficient training to use the equipment), derisory quality control and quality assurance.

The field work identified many examples where organisations were not working in a joined-up way. For example, the procurement process within the public health system in Country A based their choice of reagent based on cost. This means that the reagents selected were low cost. While low cost does not always mean low quality, in this case the reagents not allow for accurate detection of antimicrobial resistance, leading to low data quality. This problem signals a disconnect between the finance ministry and the technical people within each country. This means that systemic issues, such as data = quality, cannot be solved by training lab technicians to carry out state-of-the-art lab testing. Even if technicians know they require high quality reagents, they may not have access to these substances, because the national procurement agency does not support the purchase of these chemicals. Thus, there is an economic value chain that is not taken into consideration, due to a disconnect of the organisations that may be associated with hierarchical relationships (ie the ministry is at a higher level and cannot be questioned by the lab professionals).

The Fleming Fund work aims to establish AMR networks, which is an on-going, long-term process. The countries visited are all in different stages in this process; some have already established network structures, while others have not. These networks are critical for the flow of good quality data.

5.2 Supporting global challenges relies on data flow across local, national and global networks

AMR surveillance requires readily available, good quality data to be shared within and across networks. Data gathered at a local level – in a hospital or vet lab- has to be aggregated and shared with district and national facilities to inform treatment guidelines. A problem in
LMICs is there are currently few systematic ways of collecting and reporting data. There are few standardised procedures and standardisation of reporting systems and data sharing and comparability with other countries is not yet possible. Links between clinical data, samples and clinical outcomes are not usually made, while any data that is available often is generated by externally funded research projects with limited lifespans.

5.3 Supporting global challenges relies on motivated and skilful professionals

Almost all the interviewees in our fieldwork reported that lab professionals reported that the tests they carry out are routine and repetitive. The number of types of tests they can carry out and the number of microbes tested for is limited, therefore there was a need to expand the technical expertise needed to perform bacterial susceptibility testing. There was a consensus about the limited opportunities to upskill and engage in professional development. These two problems, repetitive tasks and limited opportunity to develop, were associated with a perceived low value placed in these job roles. These problems were attributed to low retention rates, low salaries and poor motivation of staff, which were all viewed as major barriers in strengthening capacity. Labs are low-resource environments and lab managers and heads of units often cannot commit extra resources to support AMR surveillance and upskill professionals. Entrenched behaviours and ingrained practice amongst members of staff appear to impact the quality of data. This problem is exacerbated by the fact that the public health systems place constraints in making the sort of Human Resources changes that are necessary to improve the system.

5.4 Supporting global challenges involves changing ingrained practice

During the field trips, interviewees drew attention to extensive and often unnecessary use of antimicrobials in human health, animal health and food production processes. It is well known that AMR is driven by an evolutionary response of microbes, but this phenomenon is usually made worse by ingrained professional practice. Each node in the network is likely to have key professions where awareness of AMR could be raised to help change these ingrained practices.

5.5 Supporting global challenges requires trust and openness amongst professionals

During the fieldwork we identified a number of cases where ‘lack of trust’ impeded work.
Sometimes trust issues are associated with hierarchical structures within health systems. Frequently clinical staff and laboratory staff do not communicate effectively. Nor do they understand how their work interlinks. This problem leads to a lack of trust that impacts the use of AMR data to guide treatment. Tensions between key groups of professionals is not limited to the clinician-laboratory staff relationship, though this is a major difficulty within the public health part of the network. Laboratories are often run by people without a medical

background, which may be perceived as problematic by clinicians. This problem is aggravated by the perception of hierarchy, since lab professionals “cannot exert weight” when giving advice on which antibiotics should be used in the treatment of patients. Clinicians sense responsibility in treating a patient, but often do not trust the lab data. This lack of trust might explain why clinicians follow entrenched prescription practices.

These findings offer a new perspective on capacity building for global challenges, arguing that professional learning must extend beyond knowledge and skills development, to include reflection on and making adjustments to the work system and network.

6 Recommendations for professional learning to support global challenges

Key recommendations for professional learning to support AMR surveillance in LMICs have been identified from these findings. These recommendations are generic and are likely to be helpful for those planning professional learning in LMICs in ways that support a broad range of global challenges:

6.1 In parallel with providing learning opportunities, focus on creating well-functioning workplaces and networks

Learning skills and knowledge in itself is not sufficient to tackle AMR. For capacity building to be effective, skills training has to be accompanied by a reflection on and re-organisation of the work environment. This involves examination of current and future roles and work practices and making necessary adjustments to work processes and practices. This could be achieved by designing professional learning events in ways that allow policymakers, senior laboratory professionals and lab professionals to reflect upon and reimagine how work is structured and how new practices (e.g. data use and interpretation) can be built and sustained.

6.2 Expand traditional forms of organisation, by supporting work and learning across boundaries

To expand beyond traditional ways of working, for example where clinicians and labs are disconnected, there is a need to consider new roles that bridge across sites. New roles can be introduced within the system to act as brokers between various groups (for example a One Health Officer could connect different facilities).

6.3 Motivate professionals by offering learning opportunities and valuing career pathways

Professional Development programmes should become an on-going provision and embedded within existing structures. However, opportunities to enhance the professional skills should be associated with valuing each profession. Pedagogic leadership development should be a key feature of professional learning programmes, especially for professionals in key training roles.

6.4 Encourage trust and openness amongst professionals, by designing learning that supports collaborative work.

Collaboration and cooperation across key professional groups can be improved through supporting collaborative working and fostering interdependence across professional groups. Each professional needs to understand how his or her work fits within the system and how it inter-relates to the work of other professionals to ensure people have shared values.

The paper provided an account of the ways professionals in human, animal and environmental health sectors can expand their capacity to work with antibiotics in ways that reduce antimicrobial resistance. AMR learning needs to focus on the needs and job role of each individual and particular forms of learning should be prioritised towards specific groups. This work points to a broader need to shift in our perspectives on capacity building for global challenges, arguing that professional learning must extend beyond knowledge and skills development, to include reflection on and making adjustments to the work system and networks.

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