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Redefining infection prevention and control in the new era of quality universal health coverage

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Abstract

Universal health coverage (UHC) is a concept that is deeply rooted in the Development Agenda and is receiving increasing attention at the global level. The interconnection of infection prevention and control (IPC), UHC and quality has not been well described. We aim to present a novel and compelling case for considering IPC as a critical part of *quality UHC* and develop a preliminary theory of change model, informed by existing literature and emerging thinking on this evolving field. A review of published and grey literature on UHC, quality and IPC was undertaken with a view to triangulating common goals and informing a theory of change. A preliminary theory of change framework describing the potential synergy between UHC, quality and IPC in catalysing concerted action at every level of the health system has been developed. A table outlining key considerations at the policy, practice and research levels is also presented. This paper considers the extent to which the global IPC community in its widest form should better position IPC as a fundamental component of quality within the context of rapidly advancing UHC-driven health system reforms. The theory of change will be

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of value to the many organisations involved in supporting countries and facilities as they move towards a true focus on UHC.

Keywords
infection prevention and control, quality of health care, safety, theory of change, universal health coverage

Introduction

In the field of public health and infectious diseases three contextual factors have influenced this paper. First, the emerging focus on universal health coverage (UHC) with quality as an essential feature, based on years of recognition that patient safety is a global concern (World Health Assembly (WHA), 2002); second, the recent shift in the focus of the water, sanitation and hygiene (WASH) sector beyond communities to WASH in health care facilities, in particular addressing the gross deficits in basic hygiene infrastructures (in support of infection prevention and control (IPC)) that are rampant across many countries of the world (WHO, 2015a); and third, the still recent devastating outbreak of Ebola virus disease (EVD) in West Africa that highlighted the lack of IPC expertise and infrastructure across entire health systems in many countries, and the consequence of such vacuums, in particular the impact on health facility processes and patient and health worker outcomes (Farrar and Piot, 2014; United Nations (UN), 2015). There appeared to be no reliable application of IPC across any country, as well as an apparent failing of leaders in many countries to have given IPC the importance it requires within health systems.

UHC is focused on 'ensuring that all people can use the promotive, preventive, curative, rehabilitative and palliative health services they need, of sufficient quality to be effective, while also ensuring that the use of these services does not expose the user to financial hardship' (World Health Organization (WHO) definition: http://www.who.int/health_financing/universal_coverage_definition/en/). UHC is concerned with the nature and availability of a health workforce, the presence of qualified specialists (including nurses), health care financing and infrastructure and system design (Moreno-Serra and Smith, 2012). Human resources in particular are an important component of health systems overall, with the need for sufficient numbers of well trained and motivated staff as well as adequate resources for the preventive element of UHC (*The Lancet*, 2012). From a feasibility viewpoint scholars argue that the focus should be on the provision of a minimum basic package to cover priority health needs for which there are effective low cost interventions, usually focused on disease-specific programmes. Abiiro and De Allegri (2015) talk about a 'guaranteed sufficient capacity of the local health system, in terms of adequate health infrastructure, qualified human resources, equipment and tools, to deliver quality health care' as an essential component of the access dimension of UHC.

Globally, hundreds of millions of people are affected every year by avoidable infections in health care settings (Allegranzi et al., 2011; WHO, 2011) and this does not take account of the additional harm caused by outbreaks. The WHO report highlights that at any given time, 7% of patients in developed and 10% in developing countries will acquire at least one health care-associated infection (HAI) and this can contribute to avoidable death. In Europe, more than 4 million patients are affected by approximately 4.5 million episodes of HAI annually,

leading to 16 million extra days of hospital stay and 37,000 attributable deaths, and contributing to an additional 110,000. In the USA, approximately 1.7 million patients are affected by HAI annually, with a prevalence of 4.5% and accounting for 99,000 deaths; limited data are available from low- and middle-income countries (LMICs), but the prevalence of HAI is estimated to be between 5.7% and 19.1%. Patients who acquire infection tend to have longer hospital stays and be treated with less effective drugs that are more toxic and/or more expensive. Some patients will not recover and others may develop long-term complications. The international call to action against antimicrobial resistance (AMR) includes more than prevention and management of HAI; however, this escalating global challenge has highlighted the importance of fundamental IPC measures when providing health care where infections may become untreatable (WHO, 2012a).

IPC is therefore an important part of quality, essential for the delivery of safe health services in all countries of the world. Its beauty is in its ubiquity, the fact that it is an understandable concept, a tangible starting point that anyone at any level of health care can grasp and act on when faced with the question 'What does safety and quality mean to you?'. IPC transcends 'silo's and a vertical programme focus that pervades much of health and development (Harries et al., 2010). This is both a strength and a value that this specialty can bring to the emerging thinking on UHC and quality.

WHO's Learning Laboratory on UHC and patient safety and quality (WHO, 2014a) singled out IPC as a central component of safe, high quality service delivery at the institutional level within the context of UHC-driven health systems. At its most basic, Learning Laboratory participants described it in terms of hand hygiene, maintaining clean bedding and preventing surgical site infections, but it also extended to reducing added health care costs from HAI. The determinants of HAI are influenced by a complex combination of gaps in policies, infrastructure, organisation and knowledge, defects in health care workers' behaviour, as well as patient-related factors (Storr et al., 2013). IPC is a response to this problem and should be viewed as a scientific discipline which builds on human factors and practical solutions grounded in epidemiology, social science and health systems strengthening, designed to prevent harm.

Yet many health care facilities in LMIC settings lack basic IPC/WASH resources, resulting in the inability to provide safe care and presenting serious health risks to those seeking treatment. Recent data from 54 countries representing over 60,000 health care facilities have highlighted the extent of the WASH problem in global health care (WHO, 2015a). Over one-third of facilities do not have access to water and soap for hand hygiene. An earlier WHO report in 2012 described health facility progress with a multimodal strategy for hand hygiene improvement in 69 countries of the world, also highlighting system-level deficits in mitigating against hand hygiene action at the point of care (WHO, 2012b). In summary, severe infrastructure constraints compromise the ability of health workers to practice IPC and in addition impact their ability to provide routine services, such as safe childbirth (Hussein et al., 2011).

Within the context of the new sustainable development goals, this paper considers IPC as a health and development force for good, integral to quality within the context of UHC at every level of the health system. What seems to emerge from the current global health literature is a lack of clarity on the interrelationship between UHC and IPC and the role the latter can play within the current development agenda. There is an opportunity to incorporate IPC into a stronger vision for the future of population health where it is viewed as an effective, cross-cutting, positive catalyst for change. A preliminary theory of

change (TOC) presented within this paper aims to initiate a debate on how this can be achieved.

A rapid evaluation of the global situation on UHC and IPC

> Without patient safety and quality, pushing for UHC would not benefit the patients – some of them would go there, experience the bad things that are going on there, shun and make sure nobody will go there anyway.
>
> Executive Director, Uganda Protestant Medical Bureau (WHO, 2014a)

Availability, acceptability, affordability and quality of health services are presented as essential subcomponents of real access to health care and are directly rooted in the human rights conceptual framework, captured in broader discussions on the right to health (WHO, 2007). Considering its interactive facets, UHC emerges from the literature as a multidimensional concept, operationalised in terms of population coverage of health-related social security systems, financial protection and access to quality health care according to need (Savedoff et al., 2012). UHC has been described both as an aspiration (Kieny et al., 2013) and part of the global move to tackle poverty and inequity – access to health services being a core part of poverty reduction and human development (Evans et al., 2012). At its heart is the goal of ensuring that all people in all countries obtain the quality health services they need without suffering financial hardship. UHC is therefore concerned with all aspects of what is considered to be a functioning health system. Within this perspective, achievement of UHC requires a range of promotive, preventive, curative, rehabilitative and palliative services (Kieny et al., 2013).

Its origins lie in both the WHO Constitution – 'the enjoyment of the highest attainable standard of health … one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition' – and the Alma Ata Declaration of 1978, calling for 'health for all'. It is also important to note that UHC is not solely concerned with health financing (WHO, 1978). Other parts of the health system are critical, including service delivery at every level, the input of motivated and responsive health workers and access to adequate supplies of quality essential medicines and technologies for diagnosis and treatment (UN, 2008). Prevention and health promotion services are highlighted, together with systems for generating evidence through research and for collating and analysing the data necessary for informed decision-making and for governing all parts of the health system.

In LMICs facing crippling shortages of skilled workers, nurses are responsible for the care of the widest range of people and for the widest geographical areas (Global Health Workforce Alliance and WHO, 2013; WHO, 2013). Mitchell (2015) states that nurses and midwives are central to realising the goals of UHC and that they bring great expertise to person-centred, individual care worldwide, but are less visible in the policy arena. Attaining UHC is therefore very much a nursing issue requiring strong leadership and influence at all levels of the health system.

Within the new list of 100 core indicators (WHO, 2015b), severe systemic infection/sepsis in the postnatal period and neonatal sepsis are highlighted as potential indicators of the quality and safety of health care. This provides a tangible example of the importance of embedding IPC/WASH within the *quality UHC* agenda. For the International Health Regulations (IHR) core capacity index, application of IPC is another example by which

nations can meet these regulations, as part of a central strategy for dealing with public health threats of international concern. Such integration has been tested in recent times based on infectious diseases such as severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS) and more recently Ebola. IPC is undoubtedly a major influencer of health outcomes at many levels of the health system, although not always explicitly described in related publications. When IPC works, when it is established and embedded, patients and health workers are protected. When it fails, whatever the cause, people are harmed and in some cases die unnecessarily. The significant economic costs of HAI to LMICs have been described (Umscheid et al., 2011; Zimlichman et al., 2013), including the associated out-of-pocket expenditure. Yet at the same time the amount that is spent on IPC-related endeavours is not fully known, making it an urgent field of further enquiry. In LMICs where IPC is at a 'virgin state' of development, the economic case for action on IPC at the policy level has not been fully articulated. What is known to some extent is the cost of HAI to individuals in terms of its impact on mortality and morbidity affecting institutions, nations and entire geographical areas. It is clear that a significant percentage of HAIs are preventable, and therefore what emerges is a debate on the avoidable costs involved. Conversely, the recent focus on AMR, including the Global Action Plan (WHO, 2014b, 2015c), highlights the massive burden related to inappropriate use of antibiotics, constituting one of the leading sources of waste in already scarce health care system resources. IPC is recognised as playing a strong role – with the emphasis on low cost interventions, applicable to all providing care, preventing microbial spread and therefore avoiding the need for antibiotic treatment.

While HAI is a universally relevant threat to anyone accessing health care there is a dimension of risk; those most likely to be affected are the most vulnerable in society – the already ill, the old, the young, the impoverished, the malnourished. This relationship has been well articulated in relation to the social determinants of health and infectious disease, described by some authors as a public health priority (Braveman, 2011; Semenza et al., 2010). The socially determined component of HAI has been less well described and remains largely implicit. Prevalence surveys conducted mainly in high-income countries continue to focus on the extent of the burden and at times the economic impact, with an evaluation of the role of social factors on the risk of HAI being absent. A recent systematic review highlights the socioeconomic dimension of the effectiveness of IPC programmes, emphasising the impact of bed occupancy, staffing levels, workload, access to equipment and training as just some of the influencing factors (Zingg et al., 2015). Moving forward, the value IPC adds in terms of addressing these social factors, including access, together with its relationship with efficiency, quality, economics and peoples' rights, will be critical for embedding in the UHC agenda.

Strategies to prevent HAI exist. Indeed, a number of IPC interventions have been placed internationally within the 'top 10 patient safety strategies that are ready for adoption now' – hand hygiene in particular being singled out as an intervention whose implementation should be widely adopted immediately (Shekelle et al., 2013). Such strategies usually embrace issues of structure, governance, accountability and human factors but, as has been highlighted already, there remains a global inequity in infection risks and rates. In 2008, the findings of a global priority setting exercise for patient safety research (WHO, 2008) ranked HAI-related research in the top 10 of 50 agreed priorities for action in LMICs. The research gaps identified included risk factors for HAI, access and affordability of products (hand sanitizers) and the effectiveness of plans for

controlling epidemics. One response to this exercise was the development of WHO's core components for IPC programmes (WHO, 2009) that list essential elements for programmes at national and health care facility level, in order to contribute to the strengthening of capacity for the prevention of HAI and to prepare an efficient response to emergencies involving communicable diseases, such as epidemics (see Table 1).

The global application of these programmes is currently unknown, but there is evidence that many weaknesses including surveillance and laboratory capacity, in particular in LMICs, continue to exist (WHO, 2014b). Bartram et al. (2015) describe the findings of the report on the status of water and sanitation in health care facilities from 54 LMICs as 'a major embarrassment for the health sector' in relation to the prevention of infection, highlighting the impact on disease and death in pregnancy and childbirth as particular concerns (WHO, 2015a). Furthermore, as a specific example, a rapid assessment of health facilities in the early stages of the EVD outbreak in Sierra Leone highlighted the significant

Table 1. WHO core components for infection prevention and control.

Organisation of IPC programmes	A structure responsible for policies, goals, strategies; legal, technical frameworks and monitoring. Existence of qualified dedicated technical staff with defined responsibilities, scope and functions. A budget adequate to meet programmed activities.
Technical guidelines	Development, dissemination and implementation of technical evidence-based guidelines for prevention of the relevant risks and/or infections, adapted to local conditions.
Human resources	Training for all health care personnel in IPC and specialised training for infection-control professionals. Adequate staff responsible for IPC activities. Address biological risks and implement preventive measures.
Surveillance of infections and assessment of compliance with IPC practices	Established priorities for surveillance of infections and pathogens, standardised case definitions and active methods of surveillance. Systematic assessment of compliance with IPC practices. Detection of outbreaks and prompt response. Documentation of the situation of HAI and IPC practices.
Microbiology laboratory	Standardisation of microbiology laboratory techniques. Promotion of the interaction between IPC activities and the microbiology laboratory. Use microbiology data for surveillance and IPC activities. Establish laboratory biosafety standards.
Environment	Minimum requirements for IPC: clean water, ventilation, handwashing facilities, patient placement and isolation facilities, storage of sterile supplies, conditions for building and/or renovation.
Monitor and evaluation of programmes	Regular monitoring, evaluation and reporting of IPC outcomes, processes and strategies at national level and in health care facilities. Promotion of evaluation in a non-punitive culture.
Links with public health or other services	Links between public health services and the facilities for events of mandatory reporting. Permanent coordination with activities related to waste management and sanitation, biosafety, antimicrobial pharmacy, occupational health, patients and consumers and quality of health care.

WHO: World Health Organization; IPC: infection prevention and control; HAI: health care-associated infection.

country-wide health system gaps, including shortages or absence of trained health care staff, personal protective equipment, safe patient transport and standardised IPC protocols. Based on rapid assessment findings and key stakeholder input, priority IPC actions were recommended. The response called for an increase in coordinated and comprehensive district-level IPC support to prevent ongoing Ebola virus transmission in household, patient transport and health facility settings (Pathmanathan et al., 2014).

Within the context of available literature pertaining to HAI, IPC, WASH and UHC, the publication of WHO's Global Strategy on People-Centred and Integrated Health Services (WHO, 2015d) cannot be overlooked. The strategy builds on the UHC and the primary health care movement and calls for a paradigm shift in the way health services are funded, managed and delivered. Although not addressing IPC directly, the report presents a service design principle for strategies to enhance access and encourage UHC. It calls for urgent action to meet the health system challenges associated with an ageing population and the impact of chronic diseases and preventable illnesses that require multiple complex interventions. It also describes how such a strategy is essential in order to better prepare for and respond to health emergency crises through integrated services. One such action to enhance UHC and high quality, financially sustainable care is to shift focus away from hospital-based, disease-based and self-contained 'silo' curative care models to a more integrated approach. Schmidt et al. (2015) also emphasise the need for a comprehensive dialogue on UHC to ensure a balance that addresses expansion of access alongside equitable improvement of health outcomes through action across all relevant sectors.

A proposed framework for interconnection: IPC and *quality UHC*

Based on the UHC patient safety and quality wheel (WHO, 2014a), Figure 1 aims to represent the role of IPC in safe, high quality people-centred care. From a promotion and prevention perspective the role of IPC programmes is well understood in terms of avoidable harm. The contribution that effective IPC makes in reducing the need for unnecessary treatments is equally well recognised, particularly within an AMR context. What has been less convincingly described perhaps is the interrelationship of IPC with palliation and rehabilitation.

Figure 2 presents a preliminary TOC (Weiss, 1995) that articulates the contribution that IPC could make to *quality UHC* and the need for concerted action at every level of the health system.

A conventional approach to HAI prevention would consider the ultimate impact of IPC programmes in terms of a reduction in HAI. This novel TOC considers reduction in HAI alongside a number of desirable long-term outcomes, spanning behaviour change of the health workforce (e.g. through better adherence to hand hygiene at critical moments) and resilient health services, all of which contribute to the desired impact of people-centred quality UHC. By undertaking a reverse mapping approach, the preconditions necessary to achieve these long-term goals can be easily conceived. The inputs and activities are presented at the global, national and facility levels, each feeding into the outputs and short- and long-term outcomes.

Using the example of the core components of IPC, it becomes clear that the development and strengthening of these global, evidence-based core components should form part of a health system service delivery-level strategy that influences policy (including composition of

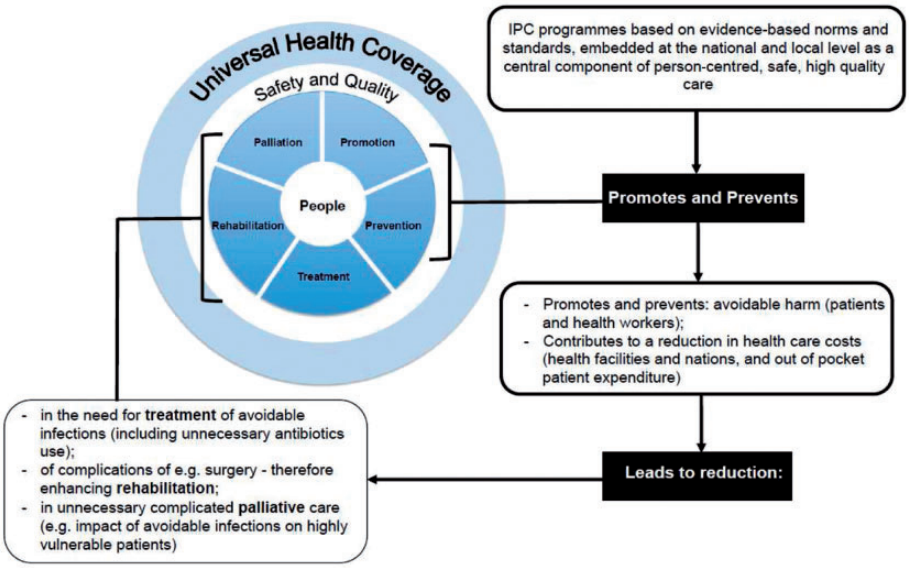

Figure 1. Strong universal health coverage-based systems with quality (infection prevention and control) as a precondition.

basic packages), funding decisions, curricula, as well as the research agenda, and contributes to enhancing access and stimulating *quality UHC* (see Table 2).

Discussion

Informed by the available literature, the time appears right to raise the profile of IPC within a *quality UHC* context. This paper suggests that there is a strong case for those working within the field of quality care, including IPC, to give serious consideration to the role that IPC occupies in the global development agenda. At the very least, the IPC community needs to develop a strong and convincing policy narrative around the relationship between IPC, quality of care and UHC. IPC is perfectly primed to leverage its strong position as a horizontal programme with impact – whatever the disease or health system focus.

Decision-makers face challenging ethical questions when setting spending priorities in light of resource constraints, influenced by values, population needs, cultural contexts, the overall health care environment and other economic and social constraints (Wagner et al., 2014). IPC exists within this context and, as stated, needs further focus to establish it as a truly low cost, effective intervention. Securing finances for health care is a necessary but insufficient condition for systems that are equitable and provide good quality care. The challenges of high quality and equitable health care are clearly many and most acute in LMICs because of a multitude of reasons including rapidly growing populations, a high prevalence of infectious diseases, as well as the growing burden of non-communicable illnesses, in all of which IPC can play a clear role.

On the international stage, 10 years ago, the 58th World Health Assembly in 2005 endorsed a resolution calling on member states to 'ensure that health-financing systems include a

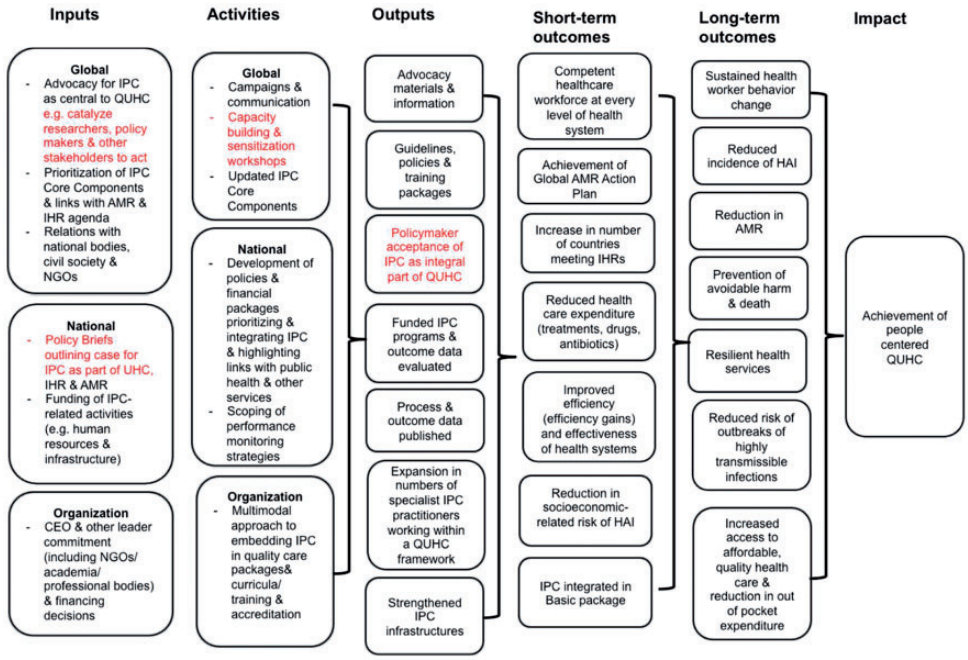

Figure 2. Preliminary theory of change for infection prevention and control (IPC) and quality universal health coverage.

AMR: antimicrobial resistance; UHC: universal health coverage; IPC: infection prevention and control; *QUHC*: quality universal health coverage; IHR: International Health Regulations; CEO: chief executive officer; NGO: non-governmental organisation; HAI: health care-associated infection.

method for prepayment of financial contributions for health care, with a view to sharing risk among the population and avoiding catastrophic health care expenditure and impoverishment of individuals as a result of seeking care' (WHA, 2005). Thus, the conceptual underpinning of UHC lay in 'sustainable health financing' and not in the mechanisms of health care delivery or the nature of health systems. UHC as a vehicle for securing sustainable financing for health systems over time began to conflate with health systems design, with a necessary re-focusing on quality of care as a fundamental precondition.

The proposed TOC provided in this paper aims to ensure a strong convergence between efforts at preventing HAI, including the associated costs, and other global threats from infectious diseases and *quality UHC*. This proposal applies to all countries, with acknowledgement that progress is most needed in LMICs. A multimodal, multi-stakeholder approach is vital to success, rather than a 'silo' focus. At the present time there is a lack of clarity on how the service design principle of people-centred and integrated health services can act as a driver to support and improve, for example, the development of new IPC core components fit for the sustainable development goal era.

There are many areas not explored here, including the IPC connection with the patient safety agenda and the rising focus on primary care and public health. Going forward, further exploration, as well as feedback on reflections of IPC's role within the health system framework, from a truly global perspective, is called for.

Table 2. Key summary points for policy, practice and research.

Domain	Key points to consider
Policy	• The development of IPC policy briefs to strengthen health policy capacity in particular focusing on a strong narrative on the interrelationship of IPC with palliation and rehabilitation in relation to integrated people-centred care • A multi-stakeholder collaboration to revise and update the existing WHO core components for IPC programmes as they relate to *quality UHC*, together with associated implementation and evaluation recommendations, aligned with new policy briefs • Clarification of the role of civil society in advocating for action on IPC • Renewed focus on social marketing and campaigning in support of progress and building upon the IPC communities experience in this field
Practice	• Technical support and guidance to national governments by WHO and other development partners to build local institutional capacity on IPC within a UHC context, including addressing health system constraints • Strengthen the role of clinical nurses and nurse specialists in supporting and acting on UHC, including by targeting undergraduate and postgraduate curricula
Research	• The development of a research agenda focused on: – Revisiting the 2008 global priority setting exercise for patient safety research (WHO, 2008) – The relationship between UHC and IPC and the value IPC adds in terms of addressing access, eciency, quality and equity – The relationship between the core components of IPC programmes and the service design principles of people-centred and integrated health services – The social determinants of health and HAI – The relationship between HAI and non-communicable diseases to enhance the economic and health-related quality of life dimension of IPC • A commitment to implementation research by national and local governments in support of the academic community, civil society and other key stakeholders

WHO: World Health Organization; UHC: universal health coverage; IPC: infection prevention and control; HAI: health care-associated infection.

Conclusion and recommendations

The relevance of IPC to the 'single most powerful concept that public health has to offer' (Chan, 2012) is beginning to become clearer, and the global community of nurses – frontline, specialist, managerial, leadership and academic – who on a day-to-day basis turn rhetoric into reality have an important role to play in making this happen. WHO's focus on UHC and quality, as well as the establishment of a new global IPC unit based within the Service Delivery and Safety Department of WHO (http://www.who.int/gpsc/ipc/en/), mean that there is leadership support and a foundation for the proposals in this paper.

This new IPC effort will be fully aligned with the WHO focus on ensuring the effective triangulation of UHC, quality and IPC to drive action within global, national and local public health. There remain, however, many gaps in current thinking. The IPC community needs to better understand and articulate its critical role in quality of care within the context of UHC, including the socioeconomic dimension of IPC and HAI. It needs to clearly

articulate the role it occupies in *quality UHC* and health system strengthening as well as its contribution to population health outcomes, including the value of the cost investment when considering affordable health services. Unless this happens, systems moving towards UHC will be impeded in embedding IPC within health systems designed to deliver safety, quality, efficiency and effectiveness for everyone. In parallel, the current generation of health care workers, including nurses and leaders at every level, is faced with a once-in-a-generation opportunity to redefine the value that IPC can bring to the quality of peoples' lives and to support just how IPC will be incorporated into global health and development in the new world agenda of *quality UHC*. In order to capitalise on this opportunity the TOC model highlights the action required at a number of levels.

At the global and national levels, a new policy dialogue is warranted that better presents IPC as a serious consideration for policy-makers, funders and research institutions. At the national level, HAI needs to be better recognised as a health system problem for which there are viable and effective mitigations and implementation strategies already available to support policy-level action. Leveraging the current call to action on AMR and IHR provides a natural and immediate focus for national and local governments. Such action will strengthen regional and sub-regional-level action, including taking IPC seriously and stimulating investment in the infrastructures necessary for effective IPC. The latter requires a multimodal approach based on investment in WASH alongside the development of leadership and competence, effective monitoring, and advocacy campaigns, all of which contribute to a shift in the culture around IPC and HAI prevention. Predicated on global and national action at the institutional level, IPC will have a better likelihood of being embedded within an effective functioning health system. Action at each of these levels is crucial in catalysing sustainable changes in the structures and processes required to influence behaviour. Building on the viewpoint of Schmidt and colleagues (2015), integrating IPC within UHC will go some way to ensuring a continued focus on equitable improvement with associated benefits in terms of reduction of harm and death, alongside the pursuit of more health care services for populations around the world. The authors recommend further exploration and sharing of information from those in the field as to how the proposals described here could influence future work for this global agenda.

Key points for policy, practice and/or research

- IPC is an important part of quality and essential for safe health service delivery in every country of the world.
- However there is at present a lack of clarity on the interrelationship between quality UHC and IPC, and the latter's role within the current development agenda.
- This paper presents IPC as central to the quality dimension of strong UHC-based health systems and describes a preliminary theory of change informed by current literature.
- Moving forward, a focus on the development of a strong policy narrative and the provision of technical support and guidance to national governments is proposed together with a fresh look at the research agenda to address identified gaps.

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