The contribution of hospital doctors to public health

To maintain their effectiveness as leaders in the delivery of health care, hospital doctors increasingly require a population approach to clinical practice. Historically, physicians practising within the traditional boundaries of health-care services – primary and secondary care – have made substantial and often transformational contributions to the improvement of population health. However, emerging financial, demographic and public health challenges require NHS clinicians on the frontline of care to draw on increasingly stretched resources to manage clinical problems that are more complex than ever before.

The case is often made for the value of 'population' approaches to the organization and management of health services (Gray and Ricciardi, 2010) – but what is the role of hospital doctors in furthering public health objectives? To do so, physicians should be aware of and seek to integrate public health principles into their everyday clinical practice, thereby equipping themselves to improve population health as well as the quality of care for individual patients.

Defining public health

In the UK, a permanent challenge for public health professionals is to articulate the scope of their practice and 'what public health is' in ways that are accessible to people outside the profession, including clinical colleagues based in secondary care organizations.

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The working definition adopted by many public health systems is that offered by the World Health Organization, namely that public health is: 'The science and art of promoting and protecting health and well-being, preventing ill-health and prolonging life through the organised efforts of society' (Acheson, 1988). However, seemingly all-encompassing definitions offer little insight into the practical application of public health principles in clinical environments, which can seem intangible and esoteric for the jobbing clinician.

In practice, most public health work is conducted outside formal public health teams and organizations and by professionals whose job title does not include the words 'public health'. It includes a diverse set of activities that aim to change the structures and environments in society that are determinants of health outcomes (including health care). Examples include:

- Developing interventions to improve school readiness and educational attainment among children and young people
- Ensuring people can find and maintain fulfilling work
- Tackling the causes of insecure housing and homelessness
- Improving the effectiveness and efficiency of health-care systems.

The defining characteristic of public health practice vis-a-vis clinical practice therefore lies in the unit of analysis – namely, the 'population' rather than the 'patient' (Frenk, 1993). The practice of public health – sometimes known as 'population medicine' (Gray, 2013) – is distinct from clinical practice (which focuses on the treatment of individual patients) in that it is primarily concerned with improving the health of groups of patients who share particular characteristics. This insight takes root in the scientific basis of public health, which is fundamentally epidemiological, concerned with the relationships between exposures (e.g. smoking) and health outcomes (e.g. lung cancer) for defined populations (e.g. low-income people) over defined time periods.

In other respects, public health practice shares important characteristics with clinical medicine in general and academic medicine in particular. In common with both, public health is both a field of inquiry (the generation of evidence through research and epidemiological analysis) and a field of intervention (the use of best available evidence to inform and target efforts to improve health in the real world) (Frenk, 1993). In common with their hospital-based colleagues, public health professionals seek to evaluate and apply the best available evidence to develop interventions that improve health – in their case, of populations rather than individual patients (*Table 1*). The UK Faculty of Public Health identifies three 'domains' of public health, which summarize the scope of the professional practice of public health (https://www.healthcareers.nhs.uk/working-health/working-public-health/what-public-health).

Principles of public health practice

How does a population health approach translate into principles for practice that can have traction in clinical settings (Faculty of Public Health, 2010)? Below are five core tenets of a public health approach that, when integrated into clinical practice, have the potential to greatly impact public health challenges:

1. Evidence-based practice: as is true in the practice of clinical medicine, evidence is the basis of public health action and underpins the other principles. Epidemiology is the scientific basis of public health; taking an epidemiological approach not just to the management of individual patients but to the provision of interventions and services can improve outcomes for whole populations of patients.
2. Prevention: preventing disease can avoid morbidity and mortality and reduce financial pressure on health-care

systems, freeing up resources (financial and human) to address the needs of other patients in the system.

3. Addressing social and environmental determinants of health: public health acknowledges that health outcomes are largely determined by social, economic and environmental conditions and that it is necessary to try to change them in order to most effectively address the causes of ill health.
4. Reducing health inequalities by focusing on vulnerable groups: public health is about values as much as evidence. To achieve social justice requires us to prioritise addressing the health needs of the least well-off and most vulnerable people in society. This translates into a focus on vulnerable groups of people who often do not access the benefits of interventions intended to improve health and suffer most from their unintended consequences.
5. Organizational and system stewardship of resources: effective public health practice acknowledges that to improve health requires health services to be as efficient, effective and equitable as possible; this requires highly developed leadership and management skills as well as the application of evidence to support improvement.

Table 1. Domains of public health practice

Domain	Key areas of practice	Examples of public health practice
Health protection	■ Risk assessment, interruption of transmission and prevention of harm from infectious diseases ■ Surveillance and monitoring of infectious diseases ■ Prevention of harm from environmental hazards ■ Emergency preparedness and response ■ Vaccination and immunisation	■ Investigating and managing outbreaks of infectious disease, e.g. meticillin-resistant *Staphylococcus aureus* in hospitals. ■ Planning for pandemic influenza and managing flu outbreaks ■ Planning for and responding to major incidents with health implications, e.g. industrial incidents, terrorist attacks
Health improvement	■ Analysis of population health needs ■ Epidemiological monitoring of chronic diseases ■ Development and selection of interventions to narrow health inequalities and address social determinants of health, e.g. education, housing, employment ■ Support for behaviour change around behavioural risk factors, e.g. diet, smoking, alcohol, physical activity ■ Evaluation of health improvement interventions	■ Assessing health needs of a local homeless population to inform service planning ■ Developing a local strategy to tackle childhood obesity ■ Implementing a local service to prevent type 2 diabetes ■ Evaluating preventive interventions and services, e.g. a harmful drinking prevention programme ■ Implementing and evaluating new models of public health service delivery, e.g. smoking cessation services
Healthcare public health (maximizing the population health benefits of health care and reducing health inequalities)	■ Improving the organization, management and delivery of health services ■ Improving the quality and safety of health care ■ Service planning and commissioning to improve effectiveness, efficiency and equity ■ Audit and service evaluation ■ Clinical and quality governance	■ Analysing causes of unwarranted variation in quality of mental health services ■ Assessing equity of access to primary and secondary care for vulnerable groups, e.g. rough sleepers ■ Analysing spending and outcomes to inform local resource allocation ■ Leading evidence-based and prevention-focused commissioning of services, e.g. an integrated type 2 diabetes management programme ■ Developing and implementing an organizational clinical governance framework

Health care is an important determinant of population health

It is important to be clear about the value of health services in addressing public health challenges. Estimates of the relative impact of health care as a determinant of population health range between 15% and 40% (The King's Fund, 2013). A reason commonly forwarded for its relative unimportance is that by intervening only when disease processes are well established, health care fails to address the underlying social and environmental causes of ill health. Yet despite this, clinical medicine can lay claim to some outstanding achievements – applications of advances in basic science and translational medicine have yielded significant improvements in mortality, healthy life expectancy and quality of life at a population level, in addition to improving the health of individual patients (Gray and Ricciardi, 2010). For example, reductions in preventable mortality from cardiovascular disease, largely resulting from the introduction of innovative and evidence-based treatments, have revolutionized survival from once fatal conditions, with substantial population health benefits (Kruk, 2017).

Modern public health challenges related to the growing complexity of medical care cannot be solved without the engagement and leadership of clinicians. For that reason and by virtue of their position as leaders in the provision of care within their organizations, physicians continue to be uniquely placed to address public health challenges in the course of their clinical practice.

Public health principles applied to contemporary clinical challenges

At its heart, public health seeks to tackle the fundamental determinants of disease and ill health in populations – the 'causes of causes' – focusing on prevention through addressing socioeconomic and environmental risk factors rather than managing the conditions of individuals (Dahlgren and Whitehead, 1991). How then can clinicians, and hospital doctors in particular, be reasonably expected to contribute to the advancement of public health objectives?

Table 2. Examples of application of public health principles in clinical practice

Clinical challenge	Relevant public health principle(s)	Examples of behaviours in scope of clinical practice
Antimicrobial resistance	■ Evidence-based practice ■ Prevention ■ System stewardship	■ Avoid prescribing unnecessary antibiotics (e.g. for asymptomatic bacteriuria and upper respiratory tract infections) ■ Practise and promote narrow-spectrum prescribing ■ Provide clinical leadership for local antibiotic stewardship programmes and policies
Threats from seasonal and pandemic influenza and invasive infections	■ Evidence-based practice ■ Prevention ■ Reducing health inequalities ■ System stewardship	■ Prescribe flu vaccines for vulnerable groups ■ Provide clinical leadership for vaccination programmes and campaigns
Burden of preventable chronic disease	■ Evidence-based practice ■ Prevention ■ Addressing social determinants	■ Provide health promotion and brief advice for behavioural risk factors, e.g. smoking, harmful alcohol consumption ■ Refer for evidence-based preventive interventions, e.g. smoking cessation ■ Explore opportunities to incorporate prevention into quality improvement work
Multimorbidity and polypharmacy	■ Evidence-based practice ■ Prevention ■ Reducing health inequalities ■ System stewardship	■ Empower patients by practising shared decision making ■ Deprescribe unnecessary medications wherever possible

By analysing complex clinical challenges through the prism of public health's principles for practice, it is possible to distil the unique contribution of physicians to public health goals. The approach to a range of current and emerging clinical challenges can benefit from a public health perspective, and clinicians can often apply several public health principles simultaneously to improve the quality of care they provide for both patients and populations. In this way, providing high quality health care and furthering public health objectives are mutually reinforcing, as improving quality has the potential to dramatically impact health at a population level. The following examples demonstrate how this can be achieved in practice (*Table 2*).

Challenges relating to communicable diseases

Antimicrobial resistance

In few areas of clinical practice is the integration of public health principles with clinical practice more necessary than in tackling resistance of bacteria to antimicrobials. Common bacteria are increasingly resistant to antibiotics, damaging the capability of health systems to cope with infectious disease and threatening patient safety (Davies, 2011). As stewards of NHS resources, hospital physicians are well placed to strike the right balance between prescribing the right antibiotics when indicated, while reducing unnecessary use that threatens the capability of hospitals to effectively treat patients who develop infections.

Inappropriate prescribing of antibiotics is implicated in antimicrobial resistance and can contribute to a range of health-care-associated harms such as *Clostridium difficile* infection, with disastrous consequences both for patients and hospital resources (Charani et al, 2011). In England, a national surveillance study conducted between 2010 and 2013 showed a 6.5% increase in antimicrobial prescribing in that time, including a 12% increase in prescribing for hospital inpatients (Public Health England, 2014). Importantly, a large proportion of these antibiotics may be prescribed inappropriately, including an estimated 8.8% in primary care settings (Smieszek et al, 2018). Similarly, in the United States, up to a third of antibiotics used in outpatient settings may be prescribed inappropriately (Fleming-Dutra et al, 2016).

Reducing inappropriate prescribing is a complex behavioural challenge that is frequently the target of evidence-based interventions in clinical settings (Charani et al, 2011). For example, hospital antimicrobial resistance prevention programmes often aim to reduce overuse of antibiotics through promotion of narrow-spectrum prescribing (National Institute for Health and Care Excellence, 2015). Such counter-cultural interventions are often extremely challenging to implement successfully, requiring strong leadership skills and appreciation of the multiple influences on physician behaviour to be effective (National Institute for Health and Care Excellence, 2015). However, by combining practical experience of the factors that influence behaviour change among physicians with their position as clinical leaders, hospital doctors are well placed to lead improvements in prescribing practice, influencing local culture to enhance the effectiveness of hospital-wide interventions.

Similarly, awareness of local epidemiology and resistance patterns can empower physicians to 'narrow the spectrum' for common infections such as pneumonia, urinary tract infections and cellulitis (Elias et al, 2017; Patel and Srinivasan, 2017). Such efforts afford clinicians the opportunity to combine the application of multiple public health principles – prevention, evidence-based practice and system stewardship – to slow the growth of resistance in their local communities and contribute to the preservation of antimicrobial effectiveness. In this way, clinicians can have an impact on an important public health challenge while improving quality of care, including the effectiveness of their clinical practice.

Influenza and invasive infections

Hospital doctors have a particularly important role in protecting and improving health among vulnerable groups. For example, pandemic flu is often cited as an inevitable threat of globalisation, and seasonal flu outbreaks are a consistent feature

of the annual NHS 'winter crisis' (Campbell and Duncan, 2018). As clinicians, ensuring flu vaccinations are available and prescribed for vulnerable groups such as pregnant women, children, patients with pre-existing chronic disease and older people is a simple and effective way to mitigate health inequalities related to the impact of flu, with potential to reduce excess winter deaths (Public Health England, 2013; NHS Choices, 2018).

Additionally, providing vaccines for people with caring responsibilities – including health-care workers – is a small task that can be disproportionately beneficial for society (World Health Organization, 2012). Hospital doctors have an opportunity to lead by example in this area by taking up the flu vaccine themselves and arranging provision for their colleagues, protecting patients and building local resilience against flu.

Similarly, clinicians are well placed to combat the impacts of common infections that cluster in vulnerable populations. For example, the outbreak of invasive group A streptococcus emm type 66 among people who inject drugs in England and Wales resulted in many preventable hospital admissions among rough sleepers (Bundle, et al, 2017). Hospital clinicians played a key role by working with local microbiology and health protection colleagues to identify and treat linked cases, contributing to local epidemiological investigation and preventive interventions among homeless populations to control the outbreak.

Challenges relating to non-communicable diseases

The growing burden of preventable chronic disease

Failure to slow the growth of preventable long-term conditions is a key challenge for all health systems. For example, 63% of adults were classed as being overweight or obese in England in 2015 (Public Health England, 2017) and in the UK, the prevalence of diabetes is estimated to rise from 3.5 million currently to 5 million by 2025 (Diabetes.co.uk, 2018). Preventable conditions are already significantly impacting NHS resources and will continue to do so in the absence of transformational change in health system approaches to prevention.

Clinicians can play an important role in the prevention of chronic disease by providing evidence-based interventions that support behaviour change in their patients, particularly by focusing on the major risk factors for preventable disease and death – smoking, unhealthy diet, harmful drinking and insufficient physical activity. Risk factors for preventable disease tend to cluster in populations, i.e. a large proportion of adults do not follow any national guidance on tobacco, diet, alcohol or physical activity (The King's Fund, 2018). However, the effectiveness of brief advice and very brief advice as interventions to support behaviour change is well established (National Institute for Health and Care Excellence, 2010, 2013, 2018). It is important that physicians do not deprioritise these activities because they have the potential to positively impact population health when delivered at scale.

> "Clinicians are well placed to combat the impacts of common infections that cluster in vulnerable populations."

One public health challenge to which this particularly applies and on which physicians are well placed to act is smoking among hospital patients; by supporting behaviour change among smokers, clinicians can improve population health while reducing health inequalities. Approximately 1 in 4 hospital beds in England is occupied by a smoker, but fewer than 1 in 13 patients who smoke are referred to hospital or community-based smoking cessation services (British Thoracic Society, 2016). Supporting patients to stop smoking is likely to be most successful when advice to quit is underpinned by access to evidence-based cessation services, and hospital doctors can play an important leadership role by advocating for the provision of such services in their local communities and health-care systems (The King's Fund, 2018).

Central to enabling the NHS to meet the challenge of preventable disease is therefore the extent to which clinicians see 'prevention' as a core clinical responsibility; as hospital resources become increasingly stretched by the impacts of preventable disease and funding challenges, it will become increasingly important that physicians provide leadership to embed this culture both within their hospitals and within the wider health-care systems.

Multimorbidity and polypharmacy

Ageing populations, advances in medical technology and improving life expectancy mean that multimorbidity and its related problems are defining challenges for all health systems. In the UK, the number of people living with three or more long-term conditions was predicted to increase from 1.9 million in 2008 to 2.9 million this year (Department of Health, 2014), with massive implications for the pattern of acute medical admissions and how patients are cared for in hospital.

The related challenge of polypharmacy is associated with increased side effects, adverse drug reactions, and unacceptable treatment burdens for patients (National Institute for Health and Care Excellence, 2017). Between 2006 and 2016, there was an almost 50% increase in total community prescriptions in England and per capita prescriptions increased from 14.8 to 20 in that time, suggesting a general increase in prescribing nationally (NHS Digital, 2017).

By incorporating the principle of stewardship of resources into everyday clinical practice, physicians are uniquely placed to lead organizational responses to challenges related to multimorbidity. For example, polypharmacy is often appropriate and rational, resulting from prescription of multiple medications for discrete indications, and physicians play a key role in the monitoring and prevention of harms. However, the evidence for prescribing multiple medications simultaneously is frequently uncertain and often based on studies of 'clean' patient populations that exclude both multimorbid and elderly patients (National Institute for Health and Care Excellence, 2017). The result is that physicians are often in a position of managing patients to whom the best available evidence may not apply. By adopting a shared decision-making approach to clinical decision making, and deprescribing unnecessary or unwanted medications in the context of individual patient preferences, doctors can model 'system stewardship' in a way that both benefits patients and makes better use of the scarce resources of the NHS (Mathew and McGowan, 2016).

Importantly, there is evidence that multimorbidity and polypharmacy are also

KEY POINTS

- Historically, physicians have made outstanding contributions to improving population health through the delivery of health care.
- Improving quality of care and advancing public health objectives are mutually reinforcing, because health care remains a key determinant of health outcomes at a population level.
- However, to maximize their effectiveness in the delivery of care, hospital doctors increasingly require a population perspective to their clinical practice.
- Emerging clinical and public health challenges such as antimicrobial resistance and multimorbidity require frontline clinicians to rethink about how they practice medicine; physicians will increasingly need to think in terms of prevention, stewardship of resources and addressing social determinants of health.
- Hospital doctors are well placed to continue to lead the advancement of public health objectives by integrating public health principles into routine clinical practice, improving both quality of care and population health.

more prevalent among those living in the most deprived communities (Barnett et al, 2012). Therefore, efforts by clinicians to address these challenges have the potential to mitigate health inequalities at a population level as well as improve the care of individual patients.

The future role of hospital doctors in improving population health

Globalisation is revealing new and interconnected challenges that are already impacting how medicine is practised in all health systems. The economic, social and technological progress which drove the demographic shift from infectious to chronic disease is increasingly challenged by emerging phenomena such as antimicrobial resistance, meaning communicable and non-communicable diseases frequently co-exist. As clinical leaders in their institutions, hospital doctors are well placed to lead health system responses to the emerging public health challenges of the 21st century. As discussed above, they will be aided in doing so by seeking to integrate public health principles into their everyday clinical practice, improving quality of care while making valuable contributions to improving health at a population level. **BJHM**

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