Cumulative dissertation

for the degree of "Doctor of Public Health" (DrPH)

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Exploring new models of care in primary and secondary care, and at the interface between the two: The case for substitution

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Executive summary

Background

Western economies are facing unprecedented challenges in terms of healthcare funding: the difficulties to provide care for a population that grows older and is more and more affected by (multiple) chronic conditions are exacerbated by the financial constraints of the post-economic crisis and austerity climate. It inevitably leads to funding gaps that require efficiency savings and innovative, cost-saving models of care that would ensure a sustainable health system through the optimal use of resources. It is believed that one way forward for health systems is a stronger emphasis on primary and community care, rather than on hospital and specialist care. Reducing use of secondary care services while strengthening primary care is at the core of the idea of substitution. Substitution of a care provider for another is considered a clinically effective option for specific conditions. Substitution mechanisms are also at play in interventions which look at the relocation of services in an alternative setting and at the use of Information Technology (IT) systems as a substitute for traditional face to face consultation. However, despite the fact that substitution appears as a promising conceptual framework, the evidence is scattered and to our knowledge no research attempted to look at substitution across all the aforementioned dimensions (setting, care provider, communication medium) simultaneously.

Objectives

This cumulative dissertation proposes to synthesise and discuss findings from a series of 5 publications across 4 work packages which explored the concept of substitution with a focus on complex interventions and models of care in secondary and primary care, and at the interface between the two. More specifically, it will seek to:

- Refine the concept of substitution and identify the core characteristics of substitution interventions
- Synthesise the evidence on effectiveness, patient experience and cost-effectiveness of substitution interventions
- Identify enablers of and barriers to substitution to increase potential for replicating and transferring interventions to other settings
- Identify gaps in research and make research and policy recommendations to reinforce the evidence base.

Methods

Methods used in the publications that support the dissertation are evidence synthesis approaches (i.e. scoping review, systematic review…), international comparisons of health systems, case studies, qualitative expert interviews and economic modelling. They provide a combination of primary and secondary data analyses that all build on strong, well-document scientific methodologies.

All the studies included in this dissertation bring an international perspective to the research question, by looking at interventions and models in a selection of European and other high-income countries. Work packages focused on different points of the care continuum (from inpatient services to primary care) and different levels of the healthcare system (from intervention level to system level).

Findings

We found numerous examples of promising substitution interventions with regard to clinical effectiveness. For example (i) multidisciplinary team working, improved discharge planning, early supported discharge programmes and care pathways, which all include elements of substitution, have the potential to reduce length of inpatient stay; and (ii) substitution of care provider, setting, and communication medium can safely support the transfer of responsibility from outpatient to primary care services, through a range of interventions which include new roles for specialist GPs and nurses and the more widespread use of email communication between providers. Advantages and benefits of successful interventions from a patient perspective include decreased burden of having to travel for care, lower out-of-pocket costs, positive perception of home-like care environments, familiarity with care providers and proximity of care facilities. In general, there was poor to limited evidence on the cost-effectiveness of substitution interventions. We were able to identify only a small number of studies which attempted to rigorously evaluate the cost-effectiveness of interventions, some of which hinted at cost-effectiveness. Our research also identified unintended outcomes, when substitution incurred an increase in the use of secondary services, or increases in waste or costs to the wider health system.

As with all complex interventions, substitution does not "simply" require to transfer the delivery of care to a new setting or the responsibility of care to a new provider or to change the way care is delivered. A range of support tools, guidance materials and infrastructure are needed to ensure successful change. Education, support and mentoring are important as well.

Substitution also requires a certain degree of coordination and therefore integration between providers. It can also be enabled by integrated or linked IT systems. Barriers to substitution include the lack of appropriate skill mix, fragmented health systems and siloed organisation of care and a lack of aligned incentives across providers.

Primary care-led multi-professional organisations appear as the best environment to promote, test, and validate substitution interventions. Such units can take different forms and shapes across different European countries, but they have in common a flexibility with regard to duties and minimum set of services provided, and with regard to human resources management and composition of skill set. They are small units run by community-based providers and locally governed.

Conclusion

Carefully designed and implemented substitution interventions are often effective, have the potential to be cost-effective, and are very likely to improve patient experience. Encouraging substitution interventions therefore constitutes one way forward to improve clinical effectiveness, patient experience and/or cost-effectiveness of services in secondary and primary care and at the interface between the two. An emphasis on primary care-led health centres would create the most fertile environment for timely change and innovation adoption.

Research components supporting this dissertation

This thesis is building on the evidence from 4 work packages and 5 publications (2 are first authorships, all are in English) which have either been published or have been accepted for inclusion in peer-reviewed journals. All publications have undergone at least two blind reviews and are indexed in Pubmed. A summary of the 5 publications can be found in Appendix B.

Work packages	**Papers**
Work package 1: Inpatient services-based interventions	*Paper 1:* **Miani C**, Ball S, Pitchforth E, Exley J, King S, Roland M, Fuld J, Nolte E. (2014) Organisational interventions to reduce length of stay in hospital: a rapid evidence assessment. Health Services and Delivery Research; 2 (1)
Work package 2: Outpatient services-based interventions	*Paper 2:* Winpenny EM, **Miani C**, Pitchforth E, King S, Roland M. (2017) Improving the effectiveness and efficiency of outpatient services: a scoping review of interventions at the primary-secondary care interface Journal of Health Services Research and Policy; 22(1): 53-64 (2)
Work package 3: Community hospitals-like models of care	*Paper 3:* Winpenny EM, Corbett J, **Miani C**, King S, Pitchforth E, Ling T, van Teijlingen E, Nolte E. (2016) Community hospitals in selected high-income countries: a scoping review of approaches and models. International Journal of Integrated Care; 16(4): 13 (3)
	Paper 4: Pitchforth E, Nolte E, Corbett J, **Miani C**, Winpenny EM, van Teijlingen E, Elmore N, King S, Ball S, Miler J, Ling T. (2017) Community hospitals and their services in the NHS: identifying transferable learning from international developments scoping review, systematic review, country reports and case studies. Health Services and Delivery Research; 5(19) (4)
Work package 4: Primary care-based prescribing intervention	*Paper 5:* **Miani C**, Martin A, Exley J, Doble B, Wilson E, Payne R, Avery T, Kirtley A, Meads C, Morgan Jones M, King S. (forthcoming) Clinical and cost-effectiveness of issuing longer versus shorter duration (3 month vs. 28 day) prescriptions in patients with chronic conditions: Systematic review and economic modelling [Accepted, estimated publication date in Health Technology Assessment: July 2017] (5)

1. Background / public health relevance

1.1.Improving health through health services research

The delivery of high quality health services to the population is an important aspect of Public Health. Health systems that deliver high quality care are those which minimise the risk and impact of illness and not only promote good population health through education and prevention, but also maintain the health of the population through improving the quality, organisation and financing of health services. (6) The delivery of appropriate health services also aims to strengthen public health through responding to the healthcare needs of different populations groups, improved access to services for all and reduced health inequalities across population groups and regions. (7, 8) By approaching what we will describe as some of today's most pressing challenges in health and healthcare through the lens of Health Services Research (HSR) (see Box 1), this dissertation proposes to identify and discuss possible avenues towards better health for European populations.

Box 1 Definition of Health Services Research

AcademyHealth defines health services research (HSR) "as the multidisciplinary field of scientific investigation that studies how social factors, financing systems, organizational structures and processes, health technologies, and personal behaviors affect access to health care, the quality and cost of health care, and ultimately our health and well-being. Its research domains are individuals, families, organizations, institutions, communities, and populations."

In a few words, HSR is about:

- What works
- For whom
- At what cost
- Under what circumstance.

Source: AcademyHealth (9)

But first, it is important to briefly describe those challenges and the burden that they represent for European health systems.

1.2.The rise of chronic conditions

A combination of greater longevity and life-style factors (e.g. diet, lack of physical activity, smoking…) is contributing to the rise of chronic diseases in Europe.(10) The World Health Organization (WHO) defines chronic conditions as requiring "ongoing management over a

period of years or decades".(11) They cover a wide range of health problems such as heart disease, diabetes, asthma, some mental disorders (e.g. depression) and cancer, as well as some communicable diseases, such as the human immunodeficiency virus (HIV), which advances in drug development and treatment have transformed into chronic health problems.(10) These conditions tend to require a complex response over an extended period of time including the coordinated inputs from a range of health professionals and a practise that promotes patient empowerment.(10) The impact of chronic diseases is already profound, and all estimates indicate that the prevalence of these diseases is likely to grow substantially in the coming years, increasing the overall burden of diseases.

1.3.A rapidly ageing population

Intrinsically linked to the growing burden of chronic diseases is one demographic challenge that is most obvious in high income countries: an ageing population. In OECD countries, the share of those aged 80 and over is expected to rise from 4% in 2010 to 10% in 2050. (12) It is also estimated that by 2060, the demographic old-age dependency ratio (people aged 65 or above relative to those aged 15-64) in the European Union (EU) will increase from 27.8% to 50.1%, which means that the EU would move to have about two working-age persons per person over 65 year old, instead of 4 now.(13) Such a dramatic demographic change has consequences for the health of populations and their access to healthcare services. People will live longer with chronic conditions that are expensive to treat, (14) the prevalence of some age-related conditions such as dementia will keep rising,(15) and multi-morbidities will be more and more common, since the number of morbidities and the proportion of people with multimorbidity increases substantially with age,(16). All this implies that health services are delivered in a different way,(17) moving from the traditional and widely spread model of care built around episodic and acute treatment of patients by siloed providers to a multi-professional and more holistic approach coordinated by teams of professionals ensuring continuity of care and working together in a patient-centred way.(1, 18)

1.4.The economic crisis and subsequent financial constraints

Western economies are facing unprecedented challenges in terms of healthcare funding: the difficulties to provide care for a population that grows older and is more and more affected by (multiple) long-term chronic conditions are exacerbated by the financial constraints of the post-economic crisis and austerity climate. It inevitably leads to funding gaps that require efficiency savings and innovative, cost-saving models of care that would ensure a sustainable health

system through the optimal use of resources. In the United Kingdom (UK) for instance, it has been estimated that pressure on the National Health System (NHS) will continue to grow at a rate of 4% a year due to growing demand for healthcare. In the absence of productivity gains, this could lead to a funding gap of between 44 and 54 billion GBP by 2020/2021.(19) More generally in Europe, the economic crisis has led to public spending on health per person to fall or slow in many European countries between 2007 and 2012.(20) A few countries which experienced large or sustained reductions, even saw lower public spending in 2012 than it had been in 2007 (i.e. Croatia, Greece, Ireland, Latvia and Portugal). In this kind of context, the efficient allocation of resources is crucial, and healthcare-related decision-making has to be informed by robust evidence on the effectiveness and efficiency of health services interventions and the rigorous evaluation of new models of care.

1.5. The need to rethink the roles of and the interface between secondary and primary care

Moving from acute care-focused to primary care-driven health systems

The growing recognition of the population changing needs and the aforementioned financial constraints is causing many countries to explore new strategies and approaches to healthcare delivery.(21) While spending on inpatient care constitutes a major expense in most OECD countries, ranging from 20–25 per cent of total current health expenditure in countries such as Canada and Spain up to almost 40 per cent in France and Greece (2011),(22) the rising burden of chronic diseases, ageing populations and an increasing need for cost containment, require a rethinking of the traditional approach to organising and delivering health services, including hospital care.(23) One of the main challenges for hospitals will include the need to enhance and strengthen collaboration with primary care and other services located outside hospitals.(24) Indeed, illness in older age and long-term conditions have the potential to be dealt with (more) effectively and cost-effectively in ambulatory primary and community care settings (e.g. cancer (25)). Therefore, it is believed that one way forward for health systems is a stronger emphasis on primary and community care, rather than on hospital and specialist care.(26)

Rethinking the respective roles of secondary and primary care is not without challenges though. It requires changes in the training and organisation of the healthcare workforce, with the need to redefine skills, inter-professional working and core competencies and to adjust the workforce skill mix.(27) Broadening the scope of primary care practise can be particularly challenging in health systems such as the German and the French systems, which have been confronted in

recent years to a shortage in the number of general practitioners and family physicians in some underserved areas.(28) In terms of organisational and managerial challenges, putting primary care in the "driving seat"(29) calls for more healthcare integration, including shared-care approaches, better defined care pathways and increased collaboration between health and social care. In line with these aspirations, many European countries have published national plans and designed reforms that encourage care coordination and integration (e.g. Italy,(30) Norway (31)). Policy changes that feed into this agenda include reinforced gate-keeping or coordination roles for general practitioners,(32) the promotion of novel types of service delivery models such as municipality-managed beds in Norway (33) and community hospitals in Scotland(34) and more broadly general health policy agendas that call for the removal of barriers between providers, including between primary and secondary care and between health and social care.(35)

Reorganising care through substitution

The opportunity to reduce use of secondary care services while strengthening primary care, along with the challenges that it incurs, is at the core of the idea of substitution. (36, 37) Substitution of a ***care provider*** for another is considered a clinically effective option for specific conditions such as non-urgent dermatology conditions managed by a general practitioner (GP) instead of a consultant (38) and hernia repairs performed by a specialist GP instead of surgeon.(39) Substitution mechanisms are also at play in interventions which look at the relocation of services in an alternative ***setting*** and at the ***use of Information Technology (IT)*** systems as a substitute for traditional face to face consultation, although the word substitution itself might not be used to describe them (see for example the use of "transfer" and "relocation" in Roland et al. (2006) (40) and "alternative" in Stoves et al. (2012)(41)).

However, despite the fact that substitution as a promising approach, the evidence is scattered and there is to our knowledge no research that attempted to look at substitution across all the aforementioned dimensions (setting, care provider, communication medium) simultaneously, to try and synthesise evidence of (cost-)effectiveness and identify commonalities and pathways to successful implementation along the care continuum. We therefore propose to look at substitution beyond the substitution of a GP for a specialist physician or of a nurse-led unit for a doctor-led one, in order to unearth the common traits of substitution arrangements of specific services or medical acts, to report on their effectiveness and cost-effectiveness and to identify enablers of and barriers to successful implementation.

In order to explain what we mean by substitution, let's first refer to the Cochrane systematic review by Laurant et al. (2005) on nursing services. We choose to expand their following working definition:(42)

> *"Substitution refers to the situation where task(s) formerly performed by one type of professional (i.e. doctor) are transferred to a different type of professional (i.e. nurse), usually with the intention of reducing cost or addressing workforce shortages. Substitution studies typically examine the case where a nurse is responsible for providing the same health care as a doctor, and the performance of these two practitioners is compared. For example, a nurse-led clinic for a particular disease or condition is compared to a doctor-led clinic."*

As mentioned above, we argue that the definition can be extended, and that beyond the substitution of one professional for the other, we can look, following the same logic, at the substitution of one care setting for another, one communication medium (i.e. consultation or contact type) for another. This means systematically thinking about where, by whom and how the service is delivered in the first place, and which setting, which professional and which communication medium can alternatively contribute to care delivery.

The setting refers to the location where care is delivered (e.g. hospital, GP surgery, health centre), the care provider refers to the professional delivering the care (e.g. physician, nurse, allied health professional, manager), the communication medium refers to the way care is delivered including how the interaction between the patient and the professional happens, and how the information is handled (e.g. face to face, through a device, or automated). Both secondary and primary can provide some input (e.g. financial, human, technical) and contribute to the design or implementation of substitution interventions. Outcomes, and improvements that can be made on these outcomes, drive investment in substitution interventions. The main outcomes of relevance are: clinical effectiveness, patient experience and cost-effectiveness.

2. Aim and objectives

In light of the pressures straining health systems resources described above, and of the willingness of European governments to engage with healthcare reforms towards more relevant and sustainable health systems, there is a pressing need for more evidence on which new service models and/or changes to current services will be both effective and cost-effective. Willingness to reform must indeed be supported by concrete and actionable options for interventions which

will at the same time enhance or maintain quality of services and patient experience, and be cost-saving (or at the very least cost-neutral).

Such evidence is currently disparate or lacking; that is why, by exploring the potential of substitution through looking at a breadth of interventions and models in a variety of settings and by using international comparison to learn from a range of countries, this cumulative dissertation will constitute a valuable addition to the field of health services research and will hopefully add to the evidence supporting ongoing reforms in several European countries about the development of new models of (primary) care.

2.1.Focus on complex interventions and service delivery models

This cumulative dissertation proposes to synthesise and discuss findings from a series of publications which explored the different dimensions of substitution with a focus on complex interventions (43) and models of care in secondary and primary care, and at the interface between the two. These interventions and models' reach extends from the care of individuals through local and regional health care organisations to national and international health policies.

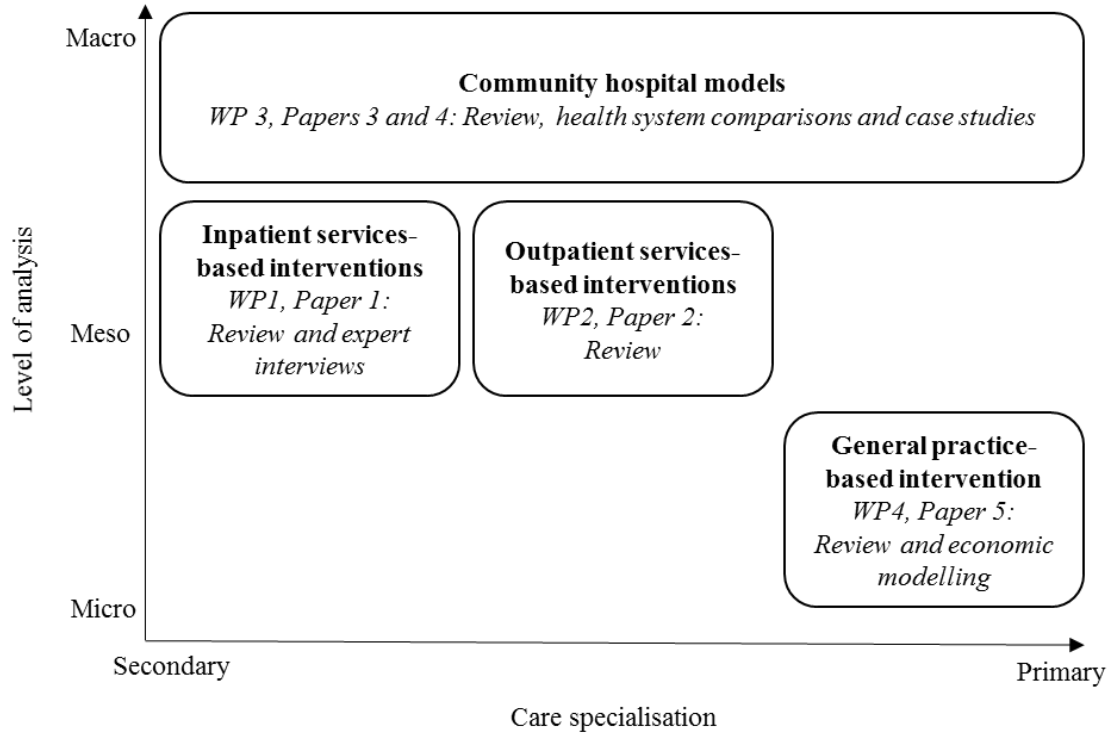
Complex interventions that are relevant to this dissertation include, but are not limited to the following areas:

- Medical practice: e.g. prescribing practices, outpatient surgical procedures
- Professional education and training: e.g. skill mix, recruitment and retention
- Professional behaviours: e.g. guidelines, communication…
- Infrastructure: e.g. building, information systems, co-location

In part due to the complexity of managing chronically ill and co-morbid patients, barriers have never been so blurred between the remit of the various healthcare providers, and flows of patients, as well as flow of professionals across the different care settings, enhance the complexity of the system and the difficulty to pin-point promising interventions and best practice. Looking at only one setting would not allow to comprehend the complexity of the system and plurality of providers and reflect the interconnectedness of the healthcare system. Relations between parties and coordination between settings and how care is organised and distributed across is at the core of the concept of substitution.

We chose to look specifically at different levels of the care continuum (Figure 1) through four main work packages (WP) and 5 publications.

Figure 1 Research components of the dissertation



Source: Author's own elaboration

We started with a focused review of in-hospital interventions, looking at what types of interventions can reduce length of inpatient stay through reorganisation (including substitution of care provider) of services (WP1). From here we shifted the scope of our research from inpatient care to outpatient care, and the relationship between outpatient and primary care. This work included all dimensions of substitution (WP2). Then we took a system-level approach, to try and explore hybrid models of service delivery, that are primary care-led but sit at the interface between secondary and primary care (WP3). Lastly, our last piece of work sought to address one of the main research gaps identified in other work packages, i.e. the lack of evidence on effectiveness and cost-effectiveness. We therefore focused on a single prescribing intervention, this time in primary care, and sought to model the impact of change of delivery (WP4).

In all work packages, the principal outcomes of interest were clinical effectiveness, patient experience (including patient satisfaction), and cost-effectiveness. We also reported secondary outcomes such as health system costs and costs to the patients.

Most of the evidence used for this dissertation was predominantly presented from the perspective of the UK current health policy debate, however, all work packages aimed to include evidence from a range of countries.

2.2.Objectives

The 4 work packages will contribute to complete the main objectives of the dissertation:

- Refine the concept of substitution and identify the core characteristics of substitution interventions
- Synthesise the evidence on effectiveness, patient experience and cost-effectiveness of substitution interventions at different points of the care continuum and different levels of the health system
- Identify enablers of and barriers to substitution to increase potential for replicating and transferring interventions to other settings
- Identify gaps in research and make research and policy recommendations to reinforce the evidence base

The critical analysis and synthesis of these different work packages will give an indication of where resources should be allocated and in which conditions success is likely to be achieved. It will allow us to have a system perspective with examples that span the whole of the healthcare system, from interventions in general hospitals to those in primary care, and policies that targets the interface between the two. The cross-country comparison and international dimension of our work will also constitute an added value, contributing to the debate about comparability and transferability of healthcare interventions and models.

3. Methodology

Methods used in the papers that support the dissertation include principally (i) evidence synthesis approaches (i.e. scoping review, systematic review…) (ii) and international comparisons of health systems. Those were complemented where relevant by (iii) case studies, qualitative expert interviews and economic modelling.

All the studies included in this dissertation bring an international perspective to the research question, by looking at interventions and models in a selection of European and other high-income countries. They are all policy-oriented and therefore provide useful evidence to support the reform of health systems through informed decision-making.

3.1.Evidence synthesis approaches

In all work packages, we have used evidence synthesis approaches to take stock of and appraise the available evidence and, when relevant, to develop new categories of analysis and conceptual frameworks. Evidence synthesis appeared as the best approach to tackle the diversity of interventions and make sense of the vast literature available. In each case, we started from thousands of references to then focus on the best evidence that would shed light on best practice and promising interventions. The relevance of evidence synthesis in healthcare research is stronger than ever. The number of health research articles and academic journals keeps growing, but what tends to be missing is the analytical skills to provide meaningful syntheses that will inform decision-making. In the same way as evidence based-medicine has changed health research, it is suggested that evidence-based policy could change health services research and policy. (44, 45)

The evidence synthesis movement in healthcare has been driven by the Cochrane group and the production of systematic reviews. However, there is now an awareness of the limitations of systematic reviews and a move to a more diverse set of evidence synthesis approaches. Complex interventions and health policies are often better evaluated through other types of syntheses. There have been recently advances in methodological development to define and conduct evidence syntheses (e.g. Anderson et al., 2011 on logic modelling (46)), and the continuous development of new tools for synthesising and assessing the quality of the evidence (e.g. Sterne et al., 2016 on quality assessment (47)) make evidence synthesis an even stronger methodological approach to health research.

Types of reviews

One key principle in the area of evidence synthesis is to recognise that different topics and research questions require different types of reviews.(48) Researchers have to choose the best fit, depending on their objectives: exploring a concept (e.g. scoping review(49)) or evaluating policy interventions (e.g. realist synthesis(50)) cannot be treated in the same way as reviewing the efficacy of a treatment versus a placebo (e.g. systematic review). (51) In this dissertation, we used different approaches, depending on the research question, objectives and type of evidence available. Table 1 below describes four types of evidence syntheses that have been used in the publications that support this cumulative dissertation.

Table 1 Description of types of reviews used in the dissertation

Type of review	Short description of the approach and type of synthesis associated with it	Reason for using the approach in the work packages
Scoping review (49)	Provides preliminary assessment of the potential quantity and scope of available literature. Can be used to assess whether there is enough evidence to conduct a systematic review. Allows for the inclusion of a diverse range of evidence types. Gives a picture/map of how much evidence is available on a topic. Can be particularly valuable for newly developing areas or where the nature of available evidence makes it difficult to undertake systematic reviews.	In work package 2,(2) we wanted to map what is currently known about strategies involving primary care that are designed to improve the effectiveness and efficiency of outpatient services and comment on the impact of such schemes on the health system. Findings gave pointers for more systematic assessment of certain types of interventions. In work package 3,(3) we aimed to update the concept of community hospitals and propose a refined definition of community hospital (CH)-like models, in light of international experience. In our analysis, we drew from principles of the critical review approach.(52)
Rapid evidence assessment (REA) (53)	Uses a systematic approach but with explicit restrictions on the scope of the search (e.g. year of publication, language) to allow a focused review within a limited timeframe. Synthesis is usually narrative. Provides a focused review that offers a timely response to specific evidence and policy needs.	In work package 1,(1) we aimed to adopt a systematic approach, although limited in time and scope, to evaluate the impact of hospital-based interventions to reduce length of stay.
Systematic review (optional: meta-analysis)(54)	Aims to provide a complete and exhaustive synthesis of the existing literature. Follows a highly standardised methodology and can include meta-analyses to pool results from high-quality quantitative studies (typically randomised controlled trials). Provides a highly robust and systematic synthesis of	In work package 3,(4) we focused on the systematic evaluation of the cost-effectiveness of CH-like models, including only quantitative studies. Due to the heterogeneity of the studies, it was not possible to pool results. In work package 4,(5) we aimed to evaluate the clinical effectiveness and cost-effectiveness of prescribing

Type of review	Short description of the approach and type of synthesis associated with it	Reason for using the approach in the work packages
	evidence. Particularly suitable when synthesising evidence from randomised controlled trials, or if quasi-experimental data is available.	medicines for 28 or 90 days. The clear alternative between two modes of delivery and the limited focus of the intervention (primary care, long-term conditions) made it possible to conduct a systematic review and to compare studies' findings in forest plots.

Source: Author's own elaboration

Key stages in the evidence synthesis process

Evidence syntheses may vary in scope and approaches, they nevertheless share a series of core principles (transparency, objective analysis, reproducibility) and key stages which contribute to their scientific value. Those stages, that follow the PRISMA statement,(55) are listed below and described in more details in Appendix A:

1) Define and refine research question and review methodology
2) Perform full search
3) Select studies for inclusion (screening)
4) Extract and characterise included studies
5) Critically appraise the quality of the studies
6) (Optional) Complementary evidence gathering (e.g. case studies, interviews, etc.)
7) Analysis and synthesis of findings (optional: meta-analysis)
8) Reporting and recommendations

3.2.International comparisons: health system review and reporting

In work package 3, we sought to compare systems in a selection of European countries and Australia and capture development of new models of care and ongoing health policy debates at the national and regional levels. International comparisons with health system review and reporting allowed for a rigorous approach and identification of differences and commonalities in the design and implementation of community hospital-like models of care.

There has been a growing interest in the systematic assessment and international benchmarking of quality of care provided in different healthcare systems, and work is under way to support this process through the development and validation of quality indicators that can be used internationally.(56) But beyond the direct comparison of key indicators and specific health

system features, cross-national comparisons, including through the use of qualitative approaches such as case studies, have also the potential to help understand policies and inform new health services decisions. Indeed, international comparisons in healthcare can use comparative analysis to facilitate learning from the experience of other health systems as an input to policy development by national governments. Topics that can be covered include areas ranging from health workforce capacity planning (28) to financing of hospitals.(24) It provides both in-depth analyses and quick to turn around syntheses informed by published evidence and expert views. International comparisons also pose the question of comparability and require to develop criteria that make comparison between two or more entities relevant. This can lead to methodological challenges and disputable choices; however the relevance of international comparisons has been demonstrated and is considered a valuable method in health services research. (57)

In an attempt to delineate the "promise" from the "actual performance" of comparative policy studies, Marmor et al. (2005) further distinguish three principal purposes of comparative analysis:(58) (i) learning *about* international health policies. Such analysis is mainly descriptive in nature and allows to give perspective and reference; it does not aim at exploring causality; (ii) learning *why* systems and policies are what they are. Such analysis seeks to identify causal explanation of particular outcomes; (iii) learning *from* other countries for potential replication of policies elsewhere. This approach would mean treating cross-country experience as 'quasi-experimental' in order to identify how and why some policies are more promising or implementable than others.

In work package 3 we focussed on the first approach, so that we could build an evidence base that established the evolution and general trends of relevant models and policies as a foundation for further research. Our analytical approach was descriptive, mainly drawing on documented evidence and key informant interviews to explore observed developments and policies. For each country under review (Australia, Finland, Italy, Norway and Scotland), we conducted an initial review of the published evidence, including documents considered as grey literature. This review followed the same stages as described in 3.1. The search of peer-reviewed and grey literature was complemented by an online country-focused search, targeting governmental or institutional websites such as ministries of health and physicians' associations. References of included documents were followed-up. Where possible, official governmental documents describing relevant reform and policy changes (in English or in original language) as well as official data provided by national and regional statistics bodies were retrieved and analysed.

The document and data review findings were then charted in a structure data collection template that captured information on the main features of the health system including information on governance, financing, organisation and delivery of services. The document review was complemented by key informant interviews (see 3.4. below).

3.3.Case studies

To complete the health system comparison of work package 3, the research team and partners in the countries under study conducted 5 case studies of community hospitals or similar models (two in Scotland, one in Finland and one in Italy) and then performed a cross-analysis of the case studies. Making comparisons between countries at the subnational level can provide useful and important information for national policy and health-care service delivery.(59) Case studies allow for a greater and in-depth understanding of "a single phenomenon within its real-life context". (60) Case study methodology follows a structured approach, involving multiple data collection procedures, in order to gain rich, detailed information about each case. (61) The case studies were conducted according to the following steps: sampling and selection of case study site, desk-based research, stakeholder interviews (semi-structured, qualitative interviews following a pre-tested and designed topic guide), non-participant observation, population profiling (using routinely collected anonymised data to develop a detailed assessment of the intervention and to understand its role in relation to other health and social care services), analysis (e.g. thematic analysis).(62) Each case study was analysed individually in the first instance. Detailed case descriptions were developed in order to describe the history, context and organisation of the community hospitals. Thematic analysis was conducted based on principles outlined by Boyatzis (1998).(62) We then compared and contrasted the four case studies and identified emerging themes before discussing and agreeing themes as part of an iterative process of writing and analysis.

3.4.Qualitative expert interviews

Expert interviews are usually designed to enhance understanding of the more salient issues pertaining to the context and processes within which health services are being delivered and function in the different system contexts. In work package 1, we completed our rapid evidence assessment with interviews with clinicians and managers This component of the research, which was designed to be exploratory only, helped place the findings of the evidence review in the NHS context and so inform how our findings might best be used to meet the needs of the NHS. In work package 3, expert interviews were part of our cross-country comparison of

models of care. The main purpose of the interviews was to gather additional insight into the role of community hospitals in a given health system and their positioning in wider context of service delivery. We identified key informants through a combination of purposive and 'snowball' strategies using the published literature, official websites, the researchers' professional networks and recommendations from other study participants. In work package 1, we interviewed 8 participants who represented four acute NHS trusts in the West Midlands and south-east of England, with sites located in a range of settings (as defined by level of deprivation and population density). They were observers of or are directly involved in the planning, implementation and delivery of interventions seeking to reduce length of hospital stay. In work package 3, twenty-eight key informants participated in interviews, a range of stakeholders involved in the organisation, governance or delivery of health services, with representatives representing from national, regional or local government, provider or provider associations and academia.

3.5.Economic modelling[1]

In order to start and address the gap in evidence about effectiveness and cost-effectiveness of interventions, we used quantitative methods to assess the impact of prescribing longer versus shorter prescriptions for groups of patients with long-term conditions in work package 4. First we performed a cost analysis of medication waste associated with longer and shorter prescription lengths using the UK Clinical Practice Research Datalink (CPRD)[2] over an 11 year period for five retrospective cohorts of patients receiving treatment for glucose control, lipid management or hypertension in type 2 diabetes mellitus (T2DM), for the secondary prevention of myocardial infarction or for depression, totaling prescriptions from 250,000 patients. In order to estimate the net cost impact of shorter and longer prescriptions lengths, the cost of dispensing fees and prescribers' time to issue a prescription were also assessed.

Then we adapted three existing decision models to predict the costs and effects of differing adherence levels associated with 28 day versus 3 month prescription lengths in three clinical scenarios. Decision modelling is used extensively in the UK as a tool for assessing and accounting for uncertainty in the medium- to longer-term costs, health consequences and cost-

[1] Although the author of this proposal did not contribute directly to the development and implementation of those methods, she had some input on the formulation of the question, the definition of the boundaries of the analysis and the discussion of the results.

[2] CPRD is a large, longitudinal, primary care dataset, comprising routinely collected, anonymised, electronic health record data from general practitioners within the NHS representing approximately 7% of the UK population (see CPRD, https://www.cprd.com/intro.asp, last accessed June 2017).

effectiveness of new health technology or, to a lesser extent, policy changes. (63) The scenarios were: (1) medications for primary prevention of cardiovascular events in T2DM; (2) treatment of depression with selective serotonin reuptake inhibitors; and (3) medications for secondary prevention of cardiovascular events in people with hypertension. The three models were adapted from models in relevant guidance by the National Institute for Health and Care Excellence (NICE). Models were adapted using results from our systematic review on adherence, along with estimated dispensing fees (from NHS drug tariffs), prescriber time (from the CPRD analysis), costs of wastage (from the CPRD analysis) and data on the relationship between treatment and no treatment (from the NICE models or reports associated with them). Results were presented as costs per quality adjusted life year (QALYs) and incremental cost effectiveness ratios (ICERs).

3.6.Ethics and Patient and Public Involvement (PPI)

Patient and public involvement (PPI) was important throughout our research, particularly as patients were not among our study participants. Frequency and intensity of consultation of the members of the public varied across work packages, but they involved, as a minimum, the following steps:

- Proposal stage: In preparation for the research proposal, we shared our research plan with a PPI panel. Panel members were asked to comment on the following: (l) Is the lay/plain English summary understandable (if not, please could you offer suggestions from a lay perspective)? (2) Is the extent and quality of service user and carer involvement in the research satisfactory and could people be involved in any other way? (3) Are the proposed research questions important and relevant to service users? (4) Is the proposed research likely to be beneficial to service users? (5) Do you have any other comments on the research plan, research questions or methods suggested? (6) Is our plan for PPI involvement throughout the study appropriate?

  Patient and public involvement respondents often made suggestions for improvement, noticing that some of the wording remained too technical or that some outcomes of interest were not included in the proposal.
- During the project: Towards the end of the study, we shared drafts of the outputs and followed up with members of the public for comments and suggestions, which were useful in finalising our outputs. At this stage, comments from the patient representatives were particularly useful with regard to the research abstract and plain English summary.

Ethics approval, when relevant, was sought and obtained. For the international case studies, each research site was responsible for obtaining the appropriate local research governance approvals as per local guidance.

4. Synthesis

This thesis is building on the evidence from 5 publications, which have either been published in peer-reviewed publications or have been accepted for inclusion in peer-reviewed publications. The full citations and a summary of the 5 publications can be found at the beginning of the dissertation and in Appendix B respectively. We synthesise our findings looking in turn at the main characteristics of substitution arrangements, the outcomes of substitution interventions, the enablers of and barriers to substitution, and the role that novel models of service delivery can play in the promotion and spread of substitution interventions.

4.1.General principles of substitution interventions

As already suggested in our definition, the evidence presented in this thesis shows that substitution does not need to cover all dimensions of substitution (i.e. setting, provider, communication medium). Depending on the intervention and the nature of the service provided, one or several areas will be affected. For example, ophthalmic injections performed by a specialist physician in a hospital can be delivered by a nurse in the same hospital,(64) with substitution only happening at the care provider level, without a change of setting or medium. Substitution can also happen in several dimensions at the same time. For example, at the setting and care provider levels, with skin examination performed by a GP in their practice instead of by a specialist physician in a general hospital.(38) Another example would be a substitution at the care provider and medium level, with a telephone consultation between a patient and a nurse replacing a face to face consultation with a GP in the surgery.(65)

By definition, a substitution intervention does not have to replace more specialised settings, higher-skilled professionals and/or more labour-intensive media with more generalist settings, lower-skilled care providers and/or more automated media. However, in most cases substitution does go in that direction, as demonstrated by the evidence supporting this dissertation and as also specified in the Laurant et al. (2005) review.(42) This is due to the fact that all other things being equal (including, for example, worker's productivity and access to diagnostic tools), care in community settings can be less expensive than in a general hospital (66) (although the evidence to this regard is not clear-cut and largely depends on organisational context and contractual arrangements (67)); nurse labour is usually less expensive than

specialist physician labour;(37) and a telephone consultation can be less costly than a face to face meeting(68) (although studies often don't take into account upfront cost of setting up a new system and maintenance efforts and investment that are required over the years (69)).

As with all complex interventions, we found that substitution does not "simply" require to transfer the delivery of care to a new setting or the responsibility of care to a new provider or to change the way care is delivered. A range of support tools and guidance materials and infrastructure are needed to ensure successful change. To support substitution, protocol and guidelines can play an essential role,(67) as do partly automated procedures and clinical pathways.(1) Education, support, mentoring (academic detailing) are also important.(67)

4.2.Outcomes of substitution

Substitution has to be motivated by potential gains in clinical effectiveness, patient experience and/or cost-effectiveness. Our research explored all these outcomes and we present below our findings for each of them.

Effectiveness

First and foremost, for an intervention to be safe, substitution must allow to achieve care of equal or greater quality compared to usual care, with the new model of care being as or more clinically effective as usual care. Evidence supporting this dissertation provides numerous examples of safe substitution with regard to clinical effectiveness. We found that (i) multidisciplinary team working, improved discharge planning, early supported discharge programmes and care pathways, which all include elements of substitution, have the potential to reduce length of inpatient stay;(1) (ii) substitution of care provider, setting, and medium can safely support the transfer of responsibility from outpatient to primary care services, through a range of interventions which include the promotion of specialist GPs and nurses and the more widespread use of email communication between providers, telephone consultation and store-and-forward medicine;(2) (iii) primary-care led models of care for older patients, such as teaching nursing homes in Norway and community hospitals in England, can help avoid general hospital stays;(4) and that longer prescriptions for long-term conditions can safely replace shorter prescriptions while limiting use of healthcare resources.(5)

Patient experience

Patient experience is another core outcome measure. Advantages and benefits of successful interventions from a patient perspective include decreased burden of having to travel for care, lower out-of-pocket costs, positive perception of home-like care environments, familiarity with

care providers, proximity of care facilities. Even when there was no evidence of gains in clinical effectiveness and cost-effectiveness, patient experience almost systematically rated better after substitution. Substitution interventions tend to have in common that they offer shorter waiting times,(67) care closer to the patient's home,(4) a more familiar environment,(4) and even sometimes a more familiar provider through continuity of care.(4, 67) At the very least, improved patient experience can drive investment in substitution.

Cost-effectiveness

In general there was poor to limited evidence on the cost-effectiveness of substitution interventions. We were able to identify only a small number of studies even attempted to rigorously evaluate the cost-effectiveness of interventions. Considering the importance of cost in policy making, this shortcoming is a weakness and will not contribute to encouraging the promotion of rapid change. However, we found a small number of studies that included a cost-effectiveness analysis, and they hinted to cost-effectiveness.(4, 5) The two systematic reviews that we have conducted, on the cost-effectiveness of community hospitals- like models of care (4) and on prescription lengths for long-term conditions (5) both include examples of cost-effectiveness through substitution interventions. This is also the case of our economic modelling of the impact of longer vs. shorter prescriptions.(5)

Unintended outcomes

Our research also identified unintended outcomes, when substitution incurred an increase in the use of secondary services, or increases in waste or costs to the health system. For example, with regard to interventions that aim to reduce length of hospital stay, we found that nursing-led inpatient units[3], a substitution to an inpatient stay in acute care facility, tend to result in an increase in length of stay.(1) Turning to outpatient services-related interventions, the evidence suggests that having specialist GPs deliver specialist care in the community, or giving GPs direct access to diagnostic tools or specialist services have the potential to increase demand for secondary care services and referrals to specialist physicians.(2) Lastly, we estimated that longer prescriptions in primary care for long-term conditions, despite certain benefits, present the risk of increasing drug waste.(5) Unintended outcomes may suggest that the new service addresses unmet needs (revealing shortcomings in usual care), but they may also reflect an

[3] Nursing-led inpatient units describe an intervention that is located in settings other than the patient's home, with a nurse as the identified leader of the clinical team, or with the authority to admit or discharge patients. Nursing-led inpatient units are among a range of services considered to manage more effectively the transition between hospital and home for patients during the recovery period.

unnecessary use of services (highlighting shortcomings in the design or implementation of the intervention). The latter can be explained in some cases (e.g. in the case of referral management centres) by a failure to initiate "significant substitution" and the creation rather of additional layers of support, with the new role or responsibility remaining a subordinate to the usual provider.(70)

4.3.Enablers of and barriers to substitution

Unintended outcomes are a reminder of the importance of contextual factors and theoretical development in the design and implementation of promising interventions. As suggested by our research, evidence is often lacking as to why an intervention is designed and how it is implemented. This lack of emphasis on the context and on the theoretical underpinning of the design, selection, implementation and reporting of an intervention, make it difficult to determine its appropriateness to a particular setting and its potential transferability.(1) However, despite these shortcomings, we were able to identify a set of enablers of and barriers to substitution that will hopefully contribute to a more systematic and informed approach in the design and selection of substitution interventions.

Enablers of substitution

Because of the mere fact that, by definition, substitution involves at least two organisations, systems or individuals, our research suggests that substitution requires a certain degree of coordination and therefore integration. Referring to the conceptual framework on integration of targeted interventions into health systems by Atun et al. (2009),(71) we can even argue that the more complex a (substitution) intervention, the more integration it will require, as the "adoption system", understood as the "key actors and institutions in the health system, but also beyond this in the broad context, with varied interests, values and power distribution in relation to the health intervention concerned" will be larger, with more diverse incentives and interests at stake.

Enablers of substitution can be related to the different dimensions of care integration described by Nolte and Pitchforth (2014):(72)

- the *process* of integration, which can be normative or systemic,
- the *degree* of integration which includes linkage, coordination and full integration,
- and the *type* of integration which can be functional, organisational, professional or clinical.

For example we have seen in our research, that with regard to the processes, the same ethos of patient-centred, holistic care can reinforce the collaboration between two organisations and facilitate their integration: this is the case for the two community hospitals we studied in Scotland and the local social care branches working with them.(73) In return, this integration will allow substitution to happen in a more systematic way with health and social care teams sharing the load of cases. Systemic integration is often the result of long historic processes, as is the case for some of the primay-care led centres vertically integrated to general hospitals that we studied in Norway.(4)

More commonly, we have been able to observe various degrees of linkage and coordination, with an emphasis on the need to promote integrated care to ensure a better management of complex (often multi-morbid) cases and chronic conditions, especially among older populations. Such integration can be seen within organisations as well as across organisations. Examples of both intra- and inter-organisation integration can be found in Finland:(4) in a primary care-led health centre, staff are required to participate in job rotation across the different units of the centre in order to maintain a wide range of skills; this coordination across units allows for overall capacity building as well as optimal role allocation depending on skills and personal interests. With regard to inter-organisational integration, the health centre coordinates the training of GPs who specialise in palliative care with relevant units in university and general hospitals. This allows in the longer-term for substitution of the health centre for the general hospital as main setting for providing palliative services.

With regard to the type of integration, we found for example that substitution can often be enabled at the functional level by integrated information technology (IT) systems. In the past decade, advances in data collection and management have been prodigious, but health systems are somehow lagging behind these fast-paced developments and struggling with the ramified complexity of data linkage and sharing. In addition, issues of ethics and data protection make it difficult to make bold data governance decisions.(74) However, the benefits of vertically integrated or laterally linked information systems can be great for healthcare organisations and their patients. (1, 4) We found that secure IT systems that allow to share medical images as in store-and-forward medicine initiatives are at the core of some substitution interventions.(67) More generally, our research suggests that allowing for easy but secure electronic communication between health professionals (one of the key recommendations of our recent research) would favour substitution.(67)

The link between substitution and integration can be more or less explicit. While we have seen that in most cases integration constitute a(n implicitly) favourable environment to substitution interventions,(4) some organisations go further and actively seek substitution as part of their integration strategy. For example, substitution is an explicit goal of a successful integrated care programme in the Netherlands which plans for three types of professional substitution: GPs or specialist nurses replacing specialists in internal medicine and practice nurses replacing GPs for the management and treatment of patients with diabetes.(75)

Barriers to substitution

Mirroring the enablers of substitution, we identified several common barriers to substitution.

We found that, at the implementation level, one first barrier is the lack of aligned incentives.(67) When one care provider or organisation "loses" the responsibility of one services, it is very likely that they also lose some kind of revenue (e.g. hospitals which are paid based on their activity level (76)). It is especially true if there is no integration between the two parties involved in the substitution. This potential loss represents a serious disincentive to collaborate and commit to substitution.(77) Any initiative to promote substitution will have to look into incentives and the alignment of interests for all parties involved.(1)

A second barrier to substitution is the lack or inadequacy of skills to endorse news roles. In many cases, substitution requires care providers to endorse a new role or to deliver a service with new means. We found that these changes need to be supported by adequate levels of training and professional development,(67) so that staff do not feel overwhelmed or isolated and that the safety of patients is maintained at all times.(4, 73)

At the cultural level, we found that managers often lack the capacity to see the "big picture" and to comprehend the complexity of the whole health system. Care provider organisations are often considered too inward-looking,(78) which can be detrimental and counter-productive when research suggests that all actors of the healthcare systems and all indicators (e.g. health and health services use indicators) are connected.(1, 79)

Our research highlighted that historic barriers can also be hard to tackle. The inherited shape of health systems can make it more challenging to envisage substitution. This can be the case when there is a stronger disconnect between specialist and primary care.(80) The issue can also come from organisation of services within one party, for example with the predominance of single doctor practices in primary care in France.(28) Indeed, research suggests that there may be more of a culture of substitution when other types of professionals are traditionally part of

the routine primary care delivery, as this is the case with, for example, specialist nurses in disease management for chronic conditions in England (81) or Medical Officers of Special Scale (MOSS) in New Zealand.(4)

In line with the analysis of enablers of substitution, most of those barriers pertain to the fragmentation of health systems and are reinforced by low levels of integration. Better integration and coordination therefore seem to appear as the first step towards substitution.

4.4.The emergence of primary care-led health centres as laboratory of substitution

While research is ongoing with regard to the development of new, or renewed, models of primary care in Europe,(82, 83) thinking about the challenges to tackle in terms of substitution can help conceptualise the issues and support the design and implementation of concrete and actionable proposals. In that context, primary care-led multi-professional organisations appear as the best environment to promote, test, and validate substitution interventions. Such units take different forms and shapes across different European countries: community hospitals in Scotland (34) and Italy,(84) health centres in Finland,(85) district health centres in Norway,(86) pluri-professional health houses in France,(87) etc. They are being promoted in France at the national policy level to re-energise underserved areas,(88) they are undergoing a new phase of development in Finland and Italy to improve care response locally for older patients (4) and are part of a broader plan to strengthen primary care in the UK.(35) They have in common some kind of flexibility with regard to duties and minimum set of services provided,(4, 84) and with regard to human resources management and composition of the skill set.(4, 73) They are usually small organisations, led by community-based care providers and composed of multi-professional teams. They offer proximity to patients through local care delivery, management and governance. The primary care-led health centres sit physically and professionally at the interface between primary and secondary care. The fact that they overtly encourage co-location or coordination of primary and more specialised care services (e.g. through regular visits of specialist physicians or recruitment of specialist GPs and nurses), integration of information systems, and collaboration between different groups of professionals,(4) make them a fertile ground for substitution to happen organically.

The aforementioned core characteristics of primary care-led health centres, shared across countries which have different health systems, have made different health policy choices in the past and are attempting to reform care delivery for various reasons now, suggest that despite differences, there is potential for this kind of organisations to flourish in a variety of context

and respond to the needs of the local populations. It shows that these models have the potential to be adapted and developed in other countries. For example, some of these new (or renewed) models, especially those which put an emphasis on the redefinition of the competences of groups of professionals (e.g. the reinforcement of the role of professionals such as nurses) and the skill mix required to deliver optimal care in the community can be of particular interest for the predominantly GP-led German primary care system that is threatened by generalist physician shortage, especially in underserved areas.(28) Indeed, in addition to the fact that those models have the potential to increase access to care in underserved areas through substitution,(4, 89) they suggest new ways forward to tackle the pressing challenges of recruitment and retention of the primary care workforce.(28)

5. Limitations and strengths of the dissertation

The evidence supporting this dissertation is partly made up of literature reviews which may need to be updated in the near future to reflect the rapid change of health services development and health services research. However, we did adopt a very systematic approach to reviewing, capturing a very wide range of evidence, and were able to contrast and compare our conceptual frameworks with previous research in the field.(90, 91) Although some new evidence may in future affect the conclusions, our frameworks will remain valid.

Another limitation is that in many cases, the evidence supporting this dissertation is scattered and may be challenged on methodological grounds. However, although the quality of the literature is at times suboptimal – something that we acknowledged in every paper – it is the best that is available on the topic of interest, and therefore it is the best indication of what the situation is. It also means that more emphasis should be put on funding research that would allow to challenge or confirm our findings. Conclusions may not necessarily be very strong in each piece of work that supports this dissertation, but all the pieces nevertheless seem to be pointing to similar findings and calling for action in the same areas.

One of the strengths of this dissertation comes from the emphasis on international comparisons. Most of our reviews did not set limitations with regard to the countries in which research was conducted, and even when there were limitations, the review still allowed for the inclusion of evidence from a range of countries (e.g. high-income countries providing universal access to care). In addition, work package 3 allowed for international comparisons of health care systems and models of care, a reflection on the relationship between system and model and on the

potential transferability of successful initiatives. This approach allows for drawing lessons to inform policy learning elsewhere and help broker knowledge between health systems.

The synthetic nature of this dissertation also proposes to go beyond research siloes and, through the prism of substitution, to look at the whole of the care continuum, and at different levels of analysis. Emerging from the categorisation of types of interventions (WP 1 and 2), the link between substitution and care integration offers a solid avenue for further health services and health policy development, culminating one the one hand in the promotion of models of care that provide a fertile ground for substitution (WP 3) and on the other hand in a concrete example of how the lack of evidence in cost-effectiveness can be tackled (WP 4). Our analytical contribution, which offers arguments to make "the case for substitution", is the fruit of a combination of methodological approaches and levels of analysis. Qualitative and quantitative evidence have been synthesised in a narrative that do not discriminate against one type of evidence, but rather build on the strengths of each approach to offer a balanced albeit complex, policy-oriented discussion on substitution.

6. Conclusion

Through the different components of our research, we were able to replace interventions in a system perspective rather than single organisation perspective. We did so by (i) developing useful categories to think about types of interventions at the interface between secondary and primary care,(1, 2) (ii) redefining and comparing emerging models of primary care (3) and (iii) providing new evidence on understudied interventions.(5) This allows us to have a clearer view of what type of research is still needed and where policy efforts and resources should focus. We believe that encouraging substitution interventions, either replicating existing interventions or designing interventions that respond to the local needs of specific communities constitute one way forward to improve clinical effectiveness, patient experience and/or cost-effectiveness of services in secondary and primary care and at the interface between the two. Substitution of professionals is already happening ad hoc for staff shortage reasons in less regulated environments such as home care.(92) This shows the potential for more strategic substitution but also an urgency to carefully plan for substitution to avoid shortfalls in the quality of care. An emphasis on primary care-led health centres would create the most fertile environment for timely change and innovation adoption. Based on these conclusions, we formulate a set of recommendations for research and health policy.

6.1.Research recommendations

More research needs to be conducted to expand the evidence base and allow to support informed decision-making. We suggest that in the future researchers prioritise the following areas of research:

- Robust evaluations of substitution interventions, especially analysis of how and why substitution works, so that managers and providers are more able to duplicate or transfer interventions to their own environment;
- Rigorous analysis of costs to determine cost-effectiveness of interventions. Effectiveness and improved patient experience may be enough to motivate investment and divert resources, but cost-effectiveness tends to make a more compelling argument;
- Exploration into the training requirements for substitution inventions and the impact such interventions may have on the workforce, including research on optimal skill mix.

6.2.Policy recommendations

With regard to the organisation and management of services, we have produced evidence (albeit preliminary) that an adequate policy response would include:

- Reforming primary care providers' education and training, including redefinition of core competencies, development of relevant skills and promotion of profiles and specialties (e.g. specialist nurses) that are in high demand, as well as incentives to attract more practitioners in community settings;
- Encouraging integration at different levels of the health system, including through the promotion of multi-professional teams in primary care, the alignment of incentives across organisations, and investment in linked information systems and data sharing;
- Promoting awareness among health managers of the possibility to substitute settings, providers or communication medium to increase effectiveness, patient experience and cost-effectiveness of care;
- Supporting the development of national and regional strategies where a pivotal role is given to small and medium-size multi-professional primary care-led models that are flexible and present an ability to respond to local needs and the opportunity to test substitution interventions.

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Appendix A Steps for conducting a review in health research

1 Define and refine research question and review methodology

Defining and refining the research question constitutes the first step of the review. It is followed by the development of the protocol that sets out in details the review methodology (including sources, search terms, time period to be covered and inclusion/exclusion criteria).

As part of the protocol development, rapid piloting of the search strategy is undertaken to ensure that search terms yield sufficient and relevant results ('hits') and that the inclusion criteria can be applied to titles and abstracts consistently. Protocols can be registered. For example, in the case of systematic reviews, the protocol can be lodged in the PROSPERO database (see http://www.crd.york.ac.uk/ PROSPERO/)

2 Perform full search

Based on the initial piloting the full search is performed. The search is usually performed in a wide range of databases in multiple platforms. Examples include Academic Search Complete, CINAHL (EBSCO), Cochrane Central Register of Controlled Trials - Central, Embase (Elsevier), ERIC (EBSCO), JSTOR, MEDLINE (OVID), PAIS International, PolicyFile, PsychInfo (EBSCO), SCOPUS, Social Science Abstracts, Web of Science, and Science Citation Index. Searches for primary studies also include backward and forward citation searching and the examination of recent tables of contents of specific journals as necessary. Depending on the topic of the review, grey literature databases (e.g. NYAM Grey Literature Report, OpenGrey, Oaister) can also be searched.

3 Select studies for inclusion (screening)

Titles and abstracts of identified studies are screened by one or two researchers for inclusion against the inclusion/exclusion criteria, following a screening pilot phase. This first screening phase is conducted within a reference manager software (e.g. Endnote). A consensus is drawn on the papers to be considered for full paper review, consulting the wider review team if necessary.

During the next stage, full papers of potentially relevant studies identified in the first pass will be obtained and screened by one or two researchers working independently, and using the inclusion criteria as a reference. Again, if there are any discrepancies, the opinion of the wider team is sought.

The number of studies identified by the search and excluded at various stages is recorded and reported in a PRISMA study flow diagram.(55) After the second stage of screening, a table of excluded studies with detailed reasons for exclusion is created and reported in an appendix.

4 Extract and characterise included studies

Studies' findings are extracted using pre-designed and piloted data extraction forms. In the case of systematic reviews extraction is done in duplication.

The data extraction form varies between reviews but is likely to include a full bibliographical reference; publication type (peer reviewed journal article, institution working paper); research question; country or region and sector studied; type of intervention if relevant; sample size and characteristics; study design and time period; analysis method; outcome(s) under investigation; findings; and study quality (if assessed).

Missing information is obtained by contacting authors wherever possible.

5 Critically appraise the quality of the studies

In the case of systematic reviews, critical appraisal is done in duplication and all included studies are assessed based on accepted contemporary standards.(54) To assess quality, we consider the risk of bias (internal validity), i.e. the extent to which design, methods, execution and analysis did not control for bias in assessment of effectiveness.(93) Validated tools appropriate to the study design such as the Newcastle Ottawa scale for cohort and case control studies are generally used.(94) Quality assessment of economic studies also follows validated guidelines, such as the Quality of Health Economics Studies instrument.(95)

The GRADE methodology guide the assessment of the quality of the evidence overall and helps summarising the results.(96)

Quality assessment of qualitative studies continues to be an area of controversy. Where appropriate, minimal standards supplemented by expert judgement are used.(97)

6 (Optional) Complementary evidence gathering (e.g. case studies, interviews, etc.)

Evidence reviews can be supplemented with other methods, for example, through the use of key informant interviews or focused case studies if there is limited evidence in some areas. Such multi-method reviews which synthesise evidence across multiple sources can be particularly useful when looking at poorly documented complex health interventions.

7 Analysis and synthesis of findings (optional: meta-analysis)

Most review in health research require synthesis of qualitative or mixed evidence and use one of a range of approaches to do this depending on the research question, quality and heterogeneity of evidence and review type.(98) This includes thematic summary and narrative review.(98, 99)

If appropriate, meta-analyses are conducted using standard software (e.g. RevMan, STATA). Any heterogeneity of results between studies is statistically and graphically assessed (e.g. forest plots). Heterogeneity can be explored through additional analyses.(100)

8 Recommendations and reporting:

Reviews should be suitable for immediate use by evidence users including managerial and frontline staff, commissioners and researchers.(45) Therefore, recommendations targeted at these groups are usually made along with a statement balancing each recommendation with the strength of evidence on which they are based.

Appendix B Summaries of the publications supporting this dissertation

For all 5 publications, the author of this dissertation (1) has made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; (2) has made substantial contributions to the final paper, by contributing drafting the paper or revising it critically for important intellectual content; (3) has approved the final version of the paper; and (4) has agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. This follows the authorship guidance as defined by the International Committee of Medical Journal Editors (ICMJE). (101)

All the research projects that led to those publications have been funded by the National Institute for Health Research (NIHR), UK.

Below we present the summaries of the articles that provided the evidence base for the dissertation. Each of them highlights the principal research question, the rationale for conducting the research, the methods used and the main findings. The summaries are identical to those that can be found in the original publications, bar some minor changes to improve format consistency throughout.

Paper 1: How effective are interventions aiming at reducing length of hospital stay? (1)

Interventions that lead to a reduction in the length of time patients have to stay in hospital are widely considered as effective measures to increase the efficiency of hospitals and, potentially, reduce costs. However, a large number of interventions could contribute to achieving this goal, ranging from planned shorter stays, such as day surgery, to those involving complex organisational changes, such as stroke units. In this study we sought to better understand the evidence base on whether or not, and how well, different types of organisational interventions in acute hospitals contribute to reducing length of stay, and other impacts these might have, for example on patient health status and experience, or on costs. We conducted a review of the literature published between 2003 and 2013, and carried out interviews with a small set of healthcare managers to help place the findings of the evidence review in the current British health system context. Although the overall evidence base is varied and lacks a robust study design, we identified a range of interventions that showed potential to reduce length of stay. These were multidisciplinary team working, for example some forms of organised stroke care; improved discharge planning; early supported discharge programmes; and care pathways. Nursing-led inpatient units were associated with improved outcomes but, if anything, increased

length of stay. Factors influencing the impact of interventions on length of stay included contextual factors and the population targeted. The evidence was mixed with regard to the extent to which interventions seeking to reduce length of stay were associated with cost savings.

Paper 2: Can some specialist services be transferred to primary care? (2)

'Moving care into the community' is a prominent feature of European health policies. But when does it make sense, and when are services better provided in hospitals? For this study, we conducted a scoping review, which explored how outpatient services could be made more efficient, including when and where these services could be moved into the community. We looked into five areas:

- Transfer: Primary care providers delivering services in lieu of specialists
- Relocation: Shifting specialist care from hospitals to primary care
- Liaison: Joint working between specialists and primary care clinicians
- Professional behaviour change: Changing the way general practitioners (GPs) refer patients to specialists
- Patient behaviour change: Helping patients make informed decisions

We found that there are a number of promising interventions which may improve the effectiveness and efficiency of outpatient services, including making it easier for primary care clinicians and specialists to discuss patients by email or phone. There remain substantial gaps in the evidence, particularly on cost-effectiveness, and new interventions should continue to be evaluated as they are implemented more widely. A move for specialists to work in the community is unlikely to be cost-effective without enhancing primary care clinicians' skills through education or joint consultations with complex patients.

Papers 3 and 4: Do primary care hospitals represent a sustainable model of care worth investing in? (3, 4)

Traditionally, community hospitals have been defined as local hospitals that are mainly staffed by general practitioners and nurses to provide care in a hospital setting, often for predominantly rural populations. However, the notion of a community hospital has evolved over time, with a diversity of service delivery models developing in response to the needs of local populations served, and in the context of a broader change in the nature of the delivery of healthcare services itself. In Europe, a growing policy focus on care integration and on shifting services closer to people's homes has led to renewed interest in community hospitals and the potential role they can play in delivering more integrated care locally. There is therefore a need to understand better the role of different models of community hospital provision within the wider health

economy. To do so, we designed a multi-method study that included: (1) a scoping review of the academic and grey literature on current provision of community hospital services in England and other high-income countries *(Paper 3)*; (2) a linked systematic review of the effectiveness and cost-effectiveness of community hospitals in England and other high-income countries *(Paper 4)*; (3) a review of the nature, scope and distribution of service delivery models that can be considered to be community hospitals in five high-income countries (Australia, Finland, Italy, Norway, Scotland), using a review of the published and grey literature following a structured data collection template and key informant interviews; and (4) four in-depth case studies of the specific financial, organisational and governance features of community hospital models in Finland, Italy and Scotland *(Paper 4)*.

We show that the concept of a community hospital encompasses a range of service delivery models that defy the formulation of a single, overarching definition. This reflects the evolution of the nature and scope of services delivered by community hospitals over time in response to changing population needs as well as the broader changes in the nature of the delivery of healthcare services itself.

Evidence on the range of services provided in community hospitals and, in some contexts, their potentially integrative role suggests that a more strategic role for community hospitals may be timely within NHS England. Better definition of their specific role in service delivery may enable community hospitals to take on proactive, preventative and step-up functions, away from their frequently reactive role in responding to demands elsewhere in the system; however, this would need to be tested. It will be important, within any process, to recognise local and national contexts that have driven the way that community hospitals have developed.

While promising, we identified a number of important challenges community hospitals are facing. These include the need for developing sustainable models of staffing, particularly in rural areas, and for overcoming persisting barriers to integrated care even where services are co-located, including inadequate IT systems. Although thought to be important, further consideration needs to be paid to the role of the community within community hospitals, in particular whether and how community hospitals can systematically identify and respond to local needs.

Paper 5: How can we improve the effectiveness and cost-effectiveness of prescribing for long-term conditions in primary care? (5)

In the British National Health Service, general practitioners (GPs) have been encouraged to issue prescriptions of shorter duration (usually 28 days) to patients with long-term conditions,

in order to reduce drug expenditure and wastage. However, the relative effectiveness and cost-effectiveness of shorter versus longer duration prescriptions is uncertain. We therefore aimed to evaluate the impact of prescription length on disease-specific measurements, drug wastage, adverse events, patient experience and satisfaction, administration time, pharmacist costs and health outcomes through: (1) a systematic review of the effectiveness and cost-effectiveness of different prescription lengths; (2) an economic modelling of the net cost to the NHS from changes in drug wastage, dispensing fees and GP time as a result of the 28 day compared to three month prescriptions as well as an estimate of health gains. We found that the evidence of the impact of longer prescriptions on health outcomes was scant, but that longer prescriptions were consistently associated with improved adherence. If medication adherence is positively correlated with health outcomes, as suggested by the wider literature, there may be benefits to the patients from increasing prescription length. With regard to costs and wastage, we found only limited evidence which suggested that longer prescriptions were cost-saving, and only when dispensing costs outweighed wastage. There is a need to evaluate the impact of differing prescription lengths on patient outcomes and to define the threshold above which longer prescriptions may no longer be cost-saving and/or cost-effective.

Céline Miani/27 July 2017

Statutory declaration

I, Céline Miani, hereby declare that I have written the present dissertation independently and have not used any sources other than those specified. When using evidence from external sources, I have clearly made reference to the corresponding publications.

I also declare that the views and opinions expressed in this cumulative dissertation are mine and do not necessarily reflect those of the co-authors of the included publications. I am sole responsible for errors and inaccuracies.

Finally I declare that the present work has not been submitted in this form as a dissertation, and I have not made any further attempts to promote it as such.

Bielefeld, 25 July 2017

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