
Learning for the NHS
on procurement and
supply chain
management:
experiences from
other industries and
countries

RAPID EVIDENCE SYNTHESIS
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Research Protocol

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1. Aims and objectives

The overarching aim of the project is to:

- (a) describe models on procurement and supply chain management in selected areas (including, but not limited to: manufacturing and automotive sectors, defence, ICT, and pharmaceutical industries)
- (b) identify models of best practice that may inform current practice on procurement and supply chain management in the NHS

The research will be undertaken in five stages:

- i. review the published and grey literature on supply chain management and procurement in non-health service industries
- ii. review the published and grey literature of how procurement and supply chain management models applied elsewhere have informed procurement and supply chain management in the healthcare sector, both nationally and internationally
- iii. assess the experience of procurement and supply chain management in the health sector in selected high-income countries
- iv. carry out interviews with key informants in the NHS to help place the findings of the reviews undertaken in (i) to (iii) in the context of the NHS
- v. develop recommendations based on the strength of the evidence reviewed and lessons learned to inform NHS procurement and supply chain management stakeholders and processes.

2. Methods

The principal approach to be used is a review of the published and grey literature based on Rapid Evidence Assessment (REA), examining how supply chain management and procurement in non-health service industries and relevant models applied elsewhere have informed procurement and supply chain management in the healthcare sector, both nationally and internationally. We will complement the REA by an assessment of current documented practice in procurement and supply chain management in the healthcare sector in a selected range of countries other than England. This second component of the work will provide important additional insights that will usefully complement the scientific evidence reviewed. Based on our previous work, we expect that a select set of interventions may appear to be promising; however, implementing such approaches in practice will depend on a range of system factors which are not easily identifiable and/or documented in the published literature. We therefore propose a third component, which involves interviews with key informants in a select set of NHS settings in order to better understand the salient issues that may facilitate or hinder the implementation of approaches to streamline procurement and supply management in the NHS. This will help in placing the findings of the evidence review in the NHS context, and thus inform how our findings might best be used to meet the needs of the NHS.

We will use a conceptual framework guiding the work to be carried out (Figure 1).

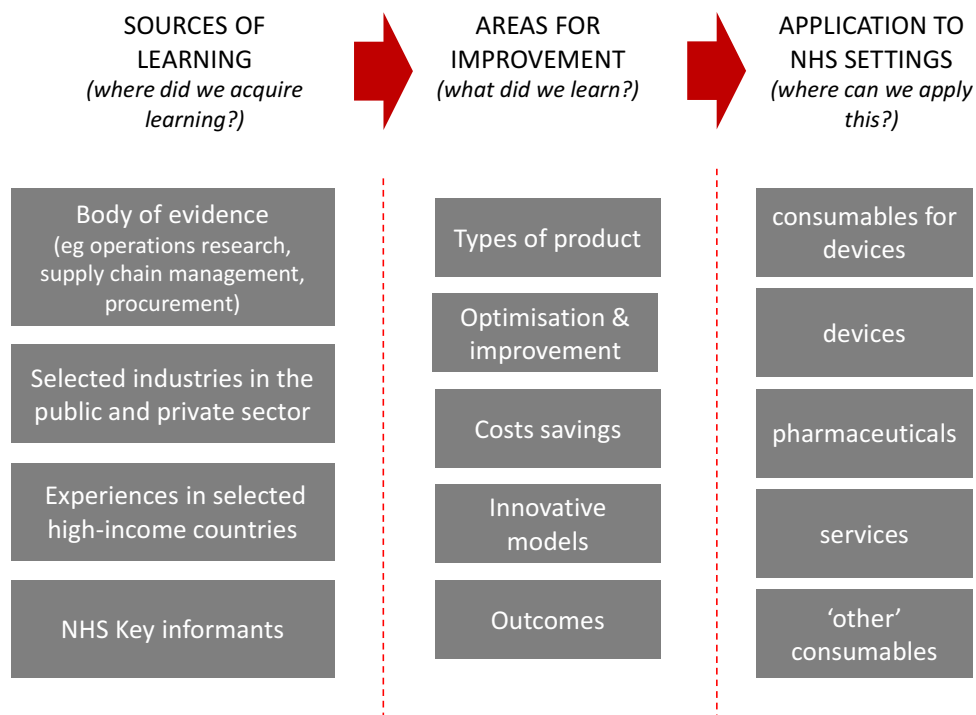


Figure 1 Conceptual framework guiding the study

2.1 TASK 1: Rapid evidence assessment

A Rapid Evidence Assessment (REA) is a comprehensive, systematic and critical assessment of the scope and quality of available evidence. RAND Europe uses a tried and tested approach to conducting REAs on a range of topics^{1,2,3}, guided by the general principles of carrying out systematic reviews in healthcare.⁴ The review will build on the collective experience of the expert team assembled for this project.

The REA principally comprises four steps:

- i. Defining the question;
- ii. Preparing the review protocol:
 - a. Defining inclusion and exclusion criteria for studies
 - b. Determining search terms
 - c. Identifying sources to be searched
 - d. Setting up information management processes
- iii. Performing the study search and assessing study relevance (including reviewing existing systematic reviews):
 - a. Pilot testing of search terms and inclusion criteria
 - b. Conducting the full search

¹ Yoong, J., Rabinovich, L. and Diepeveen, S. (2011) The impact of economic resource transfers to women versus men: a systematic review, RAND Corporation

² Nolte E., Newbould J., Conklin A. (2010) International variation in the usage of medicines: A review of the literature. Santa Monica/London: RAND Corporation & London School of Hygiene & Tropical Medicine.

³ Nolte E., Roland M., Guthrie S., Brereton L. (2012) Preventing emergency readmissions to hospital. A scoping review. Santa Monica: RAND Corporation.

⁴ Centre for Reviews and Dissemination. Systematic reviews. CRD's guidance for undertaking reviews in health care. York: Centre for Reviews and Dissemination, 2008.

- c. Reviewing titles and abstracts
 - d. Finalising inclusion/exclusion criteria
- iv. Extracting data and synthesising the evidence:
 - a. Reviewing and characterising selected papers
 - b. Assessing the qualities of the studies
 - c. Synthesising the evidence

The precise research questions will be formulated based on the objectives of the proposed work, which are to:

- a) describe models on procurement and supply chain management in selected areas (including, but not limited to: manufacturing and automotive sectors, defense, ICT, and pharmaceutical industries)
- b) identify models of best practice that may inform current practice on procurement and supply chain management in the NHS

Below, we describe in more detail the steps involved in the REA and our approach to selecting industry sectors for consideration in the review.

Preparing the review protocol and selection of industry sectors for analysis

The development of the review protocol involves first defining the criteria for inclusion of publications into the review, as well as exclusion criteria. Principal criteria relate to (i) the topic and scope of studies to be included (e.g. academic and grey literature; academic discipline; industry sector; (ii) study design (e.g. case study, observational study, systematic review); (iii) publication period and language.

Second, we will develop a systematic search strategy, including establishing a rationale for search methods as well as drafting, testing and reporting the search strategy. We will identify key search terms based on the central concepts in the review questions and also use the assistance of the support staff at the RAND library⁵ to identify further relevant terms for each concept. The appropriate methods and types of publication reviewed will depend on the sector and paradigm of research⁶, and we will elicit the advice of the expert advisors for refining our search strategy.

This stage will also include a pre-search analysis of the types of industries and sectors that we will consider for review. We will draw on a range of areas addressing concepts in supply chain management and procurement, considering primarily: operations research (inventory control, asset management), manufacturing (e.g. ‘just-in-time’, ‘build-to-order’, ‘lean’), and the general logistics and supply chain literature.

We have identified an initial set of criteria to help select industries that are likely to provide the most relevant insights to inform procurement and supply chain management in the NHS. These criteria are based on the characteristics of the procurement and supply chain mechanisms operating within the NHS, which, for example, involve a wide range of value of purchases from high value equipment and services for which there are few suppliers (eg CT scanner) to commodities, consumables and routine items for which there are many suppliers (eg syringes); coordinate a range of systems, and subsystems within (eg dialysis, intensive care units, operating theatre systems); and involve a range of purchasing stakeholders (eg clinicians, nurses, finance department, clinical engineering, IT). Accordingly, industries to be selected for detailed assessment should meet one or more of the following criteria:

⁵ RAND has its library services consisting of all main academic publications and journals and staffed by experienced librarians who can help researchers with searches of the academic and wider literature.

⁶ Singhal, K., Singhal, J., Imperatives of the science of operations and supply-chain management. *Journal of Operations Management*. Volume 30, Issue 3, March 2012, Pages 237–244.

- Stretch across/cover a range of value of purchases: from 'high-value' to 'routine items'
- Incorporate complex requirements at the user end
- Involve time-critical products at the user end
- Cover a range of systems, sub-systems and components sourced from diverse suppliers
- Incorporate globalised and fragmented supply chain
- Involve of a variety of purchasing stakeholders

At the same time, existing evidence points to innovative approaches in selected industries that may have application to the NHS also, such as the use of innovative procurement systems, as for example in the telecommunications industry. Thus, an additional criterion includes:

- Use of innovative procurement systems, including electronic systems (for example, e-procurement)

Applying these criteria to an initial assessment of existing evidence, we propose including defence and telecommunication as public sector industry examples, and pharmaceutical industry, information technology, and the automotive industry as private sector industry examples. Table 1 illustrates how the industries proposed here match to the criteria for selection.

Table 1 Criteria for selecting industry sectors for inclusion in the review

Criteria for inclusion of industry sector	Defence	Pharmaceutical	Telecommunications	Information Technology	Automotive
Range of value of purchases: from 'high-value' to 'routine items'	✓				✓
Complex requirements at the user end	✓		✓	✓	✓
Time-critical products at the user end	✓	✓		✓	
Range of systems, sub-systems and components sourced from diverse suppliers	✓			✓	✓
Globalised and fragmented supply chain	✓	✓	✓	✓	✓
Use of innovative procurement systems, including electronic systems (e.g. e-procurement)			✓	✓	
Presence of a variety of purchasing stakeholders		✓	✓	✓	

Performing the study search and assessing study relevance

We will pilot test the search terms to ensure that terms are appropriate to capture the range of relevant documents. We will also pilot test the inclusion/exclusion criteria on a sample of studies identified as potentially eligible for inclusion. Two researchers will review the same titles and abstracts in order to refine and clarify search terms and inclusion criteria, and ensure criteria are consistently applied.

The list of titles and abstracts thus identified will then be scanned for inclusion in the review. We will include documents that (i) focus on best practice procurement and supply chain management at the micro or meso level within various fields/disciplines, although we will prioritise research on those strategies and models deemed to have potential relevance to the healthcare setting as informed by our NHS key informants and expert advisors; and (ii) provide theoretical or empirical evidence on the processes involved in developing or maintaining these strategies and models.

Where appropriate and relevant, we will further scan reference lists of eligible studies identified in the pilot search to identify other studies that may be of relevance. All citations will be imported into an electronic database. We will be prioritising the search to articles published in English, but can include publications in Spanish, Dutch, German and French language where considered relevant.

Extracting the data and synthesising the evidence

We will obtain full texts of studies and documents considered eligible for review and findings will be extracted using a data extraction template. As a minimum, data to be extracted will include the

publication type; stated study objective/s; study design; methodological approach (e.g. for systematic review narrative review, meta-analysis); study limitations; and assessment of the quality of the study using standard criteria as identified above. Consistency of data extraction across reviewers will be checked through duplicate extraction of a random sample of studies by two reviewers independently. Disagreements will be discussed and resolved by consensus.

It is at this stage that we will develop a classification of the types of supply chain and procurement models available, and the particular areas within NHS procurement where the possible learning can be applied. We anticipate these settings to fall under the following headings (see also Figure 1):

- Consumables for devices (e.g. infusion connectors, cannulas)
- Medical devices (as classified by the EU Council Directive⁷), including items purchased as both capital and revenue expenditures
- Pharmaceuticals
- 'Other' consumables (e.g. bed linen, beds, stationary)
- Services related to procurement (excluding commissioning for patient care)

It is anticipated that the different models will inform different elements of the procurement systems and will therefore have to be delineated clearly. For instance, we anticipate that the synthesis will enable us to analyse the types of savings that can potentially be incurred from different types of models; such as savings accrued from reducing transaction costs (because of more efficient purchasing processes), from reducing item costs (because of more effective negotiation or from reducing other costs (savings in storage or cost of capital due to lean purchasing). Our framework for analysis will therefore include categorising the learning from both the theoretical models and the individual industry sectors into particular 'areas for improvement' as shown in Figure 1, including, but not limited to, the following:

1. Types of 'end-product': service, product, or product-service system
2. Types of improvement gained: efficiency, effectiveness, other forms of optimisation and streamlining
3. Types of cost savings: transaction costs, items costs, other optimisation costs
4. Types opportunities for innovation: e-procurement, collaborative agreements
5. Types of outcomes achieved: purchaser experience, wider economic impacts

These categorisations will inform contextualising to the types of existing supply chains in the NHS and will be verified further in Tasks 2 and 3.

2.2 **TASK 2: Assessing the experience of procurement and supply chain management in the health sector in selected high-income countries**

We will systematically explore the experience in a set of countries on their procurement and supply chain strategies within their health systems. This component principally draws on our expertise built within an ongoing project that provides comparative information and intelligence on healthcare policies in a range of European and other high income countries for the Department of Health in England. Specifically, we will carry out qualitative case studies of selected health systems involving country key informants who are part of an established International Healthcare Comparisons network (<http://www.international-comparisons.org.uk>). Country informants will be invited to provide information using a structured questionnaire exploring the principles of procurement and supply chain management strategies and approaches in detail, alongside an assessment of the health system and/or political and institutional

⁷ Council Directive 93/42/EEC of 14 June 1993 concerning medical devices

context within which the model or approaches that are being implemented to inform policy development in England. Where appropriate and relevant, we will follow up information collected through questionnaires with key informants for further information and clarification. Based on the data collected, we will produce a case report for each of the countries considered, which will be reviewed by the country informant to check for accuracy and consistency. We have been using this approach successfully for over six years in an ongoing project that provides comparative information and intelligence on healthcare policies in a range of European and other high income countries to the Department of Health.⁸

Countries or settings for inclusion will be identified from the review of the evidence undertaken in Task 1 of this work. At the outset, we propose selecting a sample of up to five countries representing the range of health system types in high-income countries, or sub-systems within these countries. Based on our previous work we provisionally propose to include Scotland, the Netherlands, selected health systems in the United States (Kaiser Permanente, Veterans Affairs), New Zealand, and Canada (Ontario). Key informants with proven expertise in the area under investigation will be identified through a range of sources, including track record in the relevant scientific literature and the applicants' own professional networks.

2.3 **TASK 3: Key informant interviews**

Interviews with key informants are particularly relevant to advance our understanding of salient issues relating to the health policy context and to help identify and categorise the often 'messy' elements of policy development. Expert judgement assessed through key informant interviews can be used to delineate the 'knowns' and 'unknowns' about the future of policy on a particular key health issue, and can help examine issues and factors that may be difficult to measure or quantify. One example where we have previously used this approach was to better understand the healthcare decision making process in a number of European countries.⁹

Key informant interviews can also provide a valuable source of information for additional sources of data including journal articles in preparation, grey literature which can then be followed up. In addition, they may serve to guide us to existing initiatives that support the NHS, such as the innovative PETO¹⁰ procurement platform. Stakeholders with purchasing roles, from Finance, Procurement, Clinical Engineering and representatives from Procurement Hubs will be targeted for interview. Our inclusion of NHS staff among the project team will assist in identifying these key informants. Informant interviews will be semi-structured, following a common interview guide. Interviews, whether carried out by telephone or person, will follow ethical principles of conducting research involving human subjects. This means key informants will be approached in their professional function only and no sensitive personal information will be collected. Data protection measures will be put in place to maintain confidentiality of interview participants of whom written consent for participation in the interview will be sought.

⁸ International Healthcare Comparisons: an on-call facility for the Department of Health. www.international-comparisons.org.uk. (See, for example, Ettelt S and E Nolte. (2010). Funding intensive care – approaches in systems using diagnosis-related groups. Santa Monica/London: RAND Corporation/ London School of Hygiene & Tropical Medicine; Nikolentzos A, Nolte E, Mays M. (2008). Paying for (expensive) drugs in the statutory system: An overview of experiences in 13 countries. London School of Hygiene & Tropical Medicine; Ettelt S, Nolte E, Nikolentzos A, Mays N. (2008) Decision-making in health care: Roles and responsibilities at local, regional and national level. London School of Hygiene & Tropical Medicine; Ettelt S, Nolte E, Mays M, Thomson S, McKee M and the International Healthcare Comparisons Network. (2006). Health care outside hospital. Accessing generalist and specialist care in eight countries. Copenhagen: World Health Organization on behalf of the European Observatory on Health Systems and Policies)

⁹ Ettelt S, Mays N, Chevreul C, Nikolentzos A, Thomson S, Nolte E. (2010). Ministry of health involvement in health service coverage decisions: is England an aberrant case?. *Social Policy & Administration*. 44:225–243.

¹⁰ Peto: Providing transparency in business to NHS markets. Available at: <http://www.peto.co.uk/> (accessed 16.5.2012)

2.4 **TASK 4: Synthesis of findings and expert advice**

We will synthesise the evidence from the REA and key informant interviews, and derive recommendations based on the strength of the evidence reviewed and how it may best be used to meet the needs of the NHS. Specifically, we will aim to identify priority areas for developing further current approaches to improving procurement and supply chain management practice in the areas for which relevant evidence is found; derive options for the use of this information in the NHS, in particular as it relates to identified gaps in current work in the NHS on the implementation of related initiatives; and comment on the appropriateness and feasibility of adapting and advancing, or possibly refocusing, existing approaches to improve productivity, efficiency, and cost savings within the NHS.

The expert advisors (academics and NHS advisors) will have two main roles in the rapid evidence assessment. They will suggest search terms and key sources of information. We will also ask them to review the synthesis of our findings as well as the conceptual framework that we will compile on the basis of the evidence as outlined above. The experts will serve as a virtual community and inputs would be sought from individual expert face to face where possible, by e-mail or by phone.

2.5 **TASK 5: Reporting and dissemination**

We believe that the proposed research is fully aligned with our mission to support better decision making in the public interest through research and analysis. The work outlined in this document aims to synthesise the existing evidence to inform decision-makers in the NHS to realise efficiencies in the healthcare system. We will produce a research report, which will draw together findings of the major strands of work undertaken. In addition, we anticipate disseminating the work through targeting (i) the research community through publication in peer-reviewed journals, and through presentation of the findings at national and international conferences and workshops in which members of the research team routinely participate; and (ii) NHS providers and decision-makers at the various tiers of the system through presentations and research notes; these are short publications aimed at busy policy makers. These would be distributed in print and/or electronically, and the format (conceptual model, presentation, report and/or briefing notes) will be tailored to the audience as is customary in the various RAND communication styles. The advice and direction from our key informants as well as NHS advisors will also help steer the method and direction of our dissemination.

2.6 **Project team**

We have brought together a multi-disciplinary team with substantial expertise and experience in systematic reviews of evidence, and in the area of healthcare organisation and management, as well as expertise from supply chain management, procurement, and operations research. Our senior team will include Dr Ellen Nolte (Director Health and Healthcare Policy research programme), Professor Ruth Boaden (Professor of Service Operations Management, Manchester Business School), Dr Matthew Bassford (Associate Director, Defence and Security, RAND Europe) and Dr Jonathan Cave (Consultant, RAND Europe and Senior Lecturer, University of Warwick).

Table 2 lists team members, and their individual roles in the project, as well as expert advisors who will be responsible for steering and providing academic expertise to the study design and findings. Advisors will be involved periodically throughout the study to advise on the learning and findings and its applicability to the NHS.

Table 2 Project team

Project team member	Role in the REA
Dr Ellen Nolte	Chief Investigator/Principal Manager (RAND)
Professor Ruth Boaden	Expert reviewer (University of Manchester)
Dr Matthew Bassford	Expert reviewer (RAND)
Dr Jonathan Cave	Expert reviewer (RAND)
Dr Saba Hinrichs	Review team/Assistant manager (RAND)
Maryse Penny	Review team (RAND)
Celine Miani	Review team (RAND)
Lawrence Ashelford	NHS advisor
Jaqui Yuen	NHS advisor
John Warrington	NHS policy advisor
Dr Katri Karjalainen	External advisor
Dr Yun Kang	External advisor

Dr Ellen Nolte directs the Health and Healthcare Policy programme at RAND Europe. She holds a PhD from London University and a master's degree in public health (MPH). Before joining RAND, Ellen was Senior Lecturer at the London School of Hygiene & Tropical Medicine (LSHTM) where she held a prestigious Career Scientist Award by the National Institute for Health Research, England, to undertake a five-year research programme into chronic diseases. Her expertise is in comparative health policy and health systems research including health system performance assessment and international healthcare comparisons on a range of health policy issues, with a particular interest in the development of innovative approaches linking health systems and population health outcomes. Dr Nolte will be acting as Chief Investigator, lead and oversee the entire project; she will be contributing 15% of her time to the project.

Professor Ruth Boaden is Professor of Service Operations Management at Manchester Business School (MBS) and Deputy Director of the NIHR Collaboration for Leadership in Applied Health Research and Care (CLAHRC) for Greater Manchester. Her research interests cover a wide range of areas within health services management and focus on quality and improvement and the use of 'industrial' methods within the NHS, as well as the implementation of new approaches. Professor Boaden will be contributing 5% of the total project days.

Dr Jonathan Cave is Senior Research Fellow at RAND Europe and Senior Tutor in Economics at the University of Warwick. He is an applied game theorist with extensive experience in policy, regulation and law and economics, and degrees from Yale, Cambridge and Stanford. Recent relevant research includes eGovernment (future prospects, impacts of technology, barriers and drivers to acceptance and adoption) and public procurement (especially in relation to innovation and procurement of ICT services and research advice), among others. Dr Cave will contribute approximately 5% of the project days.

Dr Matt Bassford is Director at RAND Europe with extensive experience of evaluation and performance audit of public procurement, service delivery and organisational change. He has particular research interests in defence policy and planning; the relationship between public, private and third sector; and the security implications of climate change. In addition, he is experienced in a variety of research methodologies including international benchmarking; facilitation skills; interviewing techniques; and futures analysis. He has a PhD in analytical science and an MBA from Imperial College London. Dr Bassford will be contributing approximately 5% of the project days.

The senior team will be further supported by Dr Saba Hinrichs (part of the project management team) who has an Engineering background with a PhD from University of Cambridge focussing on patient safety and medical device evaluation and purchasing in hospitals, in collaboration with the previous National Patient Safety Agency and NHS Purchasing and Supply Agency. She will be contributing to 30% of the project; Maryse Penny who is currently the lead analyst on a study commissioned by the European Defence Agency (EDA) aiming to map and assess dependences on non-European suppliers in the defence supply chain; and Celine Miani, an economist with a background in public policy and health economics. Together, they will contribute around 30% of their time to the project.

Our external advisors include NHS, academic, and private sector expertise: Lawrence Ashelford, Head of Planning at Addenbrookes NHS Foundation Trust; Jaqui Yuen, Procurement Team Lead for Supply Chain Procurement and Supplies at Calderdale & Huddersfield NHS Foundation Trust; Mr Ashelford and Ms Yuen will advise on placing the findings of the project in the context of the NHS environment; they will also help identify key informants for interviews. The advisory group further includes Dr Katri Karjalainen, lecturer in purchasing and supply chain management at Nottingham University Business School; Dr Yung Kan, operations researcher at the RAND Corporation in the US with a background in supply chain management and emerging technologies; and John Warrington, Deputy Director of Policy & Research of the Procurement, Investment & Commercial Division of the Department of Health who will act as advisor to the project, in particular in relation to the applicability of our findings to NHS policy development at national level.

2.7 Quality assurance

To ensure our research findings are of a high quality, our work will be subjected to RAND Europe's quality assurance procedures, involving a rigorous review of all research outputs and of the research approach. Our budget includes time to include two potential peer reviewers, one with subject expertise and one with methodological expertise. RAND quality standards are available at <http://www.rand.org/about/standards/>.

RAND Europe was awarded ISO certification in 2007. ISO (International Organisation for Standardisation) is the world's largest developer of standards. ISO is primarily concerned with "quality management" through meeting customer and applicable regulatory requirements and continually improving performance in this regard. This certification will mean that all of the procedures within RAND Europe, from research process to administration will be independently quality assured.