

**Developing Key Performance Indicators to monitor
healthcare quality**

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of the requirements for the degree of Master of Science in Health

Informatics

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university.

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Summary

It is widely accepted that measuring and evaluating the quality of healthcare has been driven by the recognition that there are variations in the quality of healthcare delivered, and concerns about the cost associated with poor quality healthcare. Together with quality improvement, measurement also contributes to learning, regulation and accountability and assists healthcare staff in their quest to provide optimal care. Key Performance Indicators (KPIs) contribute to the measurement process by capturing trends to identify opportunities for improvement in healthcare delivery.

For KPIs to be effective, they are dependent on good quality data and this can only be achieved through having definitions to ensure data are collected consistently within and across organisations. A systematic process for KPI development can contribute to the accuracy of data collection to support the availability of reliable information for all stakeholders.

Objectives:

To provide an overview of quality and methods of monitoring healthcare quality and to propose a set of guidelines for a systematic approach to the development of KPIs, based on an extensive literature review. To carry out an impact assessment, through semi-structured interview with five experienced ED personnel, of capturing data required for selected KPIs to monitor the performance of Emergency Departments (ED). The KPIs selected for the impact assessment were chosen following a review of performance monitoring in EDs internationally.

Main Findings

The impact assessment has shown that data not captured electronically as part of the care process are unlikely to be recorded accurately. There is also a need to capture additional local data to assist in the process of meeting national targets.

Conclusion

There is a need for a Unique Health Identifier (UHI) to identify patients within and between hospitals and between primary and secondary care. There is also a need to consult with stakeholders when developing KPIs to ensure the necessary data will be collected and to ensure the measurement is relevant to practice.

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Chapter 1: Introduction

1.1. Overview

There are increasing demands to monitor the performance of our healthcare system to ensure it meets the needs of society and to determine if we are getting value for money. Information on the performance of the healthcare system enables organisations to identify areas of high quality and areas in which there is room for improvement.

The idea of monitoring healthcare quality has been in existence for many years, however it is only in recent years that it has received extensive attention in published literature. In order to monitor the quality of the healthcare system it must be determined what aspects should be measured. One of the most significant developments in relation to performance monitoring in the last 30 years has been Donabedian's⁽¹⁾ division of healthcare into structure, process and outcome, for the purpose of defining and measuring quality. This division of healthcare has allowed us to identify data across the spectrum of healthcare that contributes to monitoring the quality of the various constituents of healthcare delivery.

Performance monitoring is dependant on good quality information and this can only be achieved by having a systematic process to ensure that data is collected consistently both within and across organisations. One tool that is frequently used to assist in performance monitoring are Key Performance Indicators (KPIs). KPIs are an invaluable tool that contribute immensely to the performance monitoring process. However, for KPIs to be effective they need to have clear definitions, to ensure the data collected is of high quality and to enhance the validity and reliability of the KPIs. This dissertation seeks to contribute to the performance monitoring process by delivering a set of

guidelines to assist in the process of developing KPIs and examining the impact of collecting data required for selected KPIs.

1.2. Background

Life expectancy in Ireland has increased for both men and women by approximately 5 years over the last 30 years⁽²⁾. This can be attributed, in part, to healthier lifestyles, but also to advances in healthcare. These advances in healthcare however do not come without associated costs. The budget allocation for healthcare in Ireland has increased from €3.6 billion in 1997 to almost €16 billion in 2009, which accounts for one third of total government expenditure. With the fiscal crisis now affecting Ireland, the health service needs to be accountable for the considerable amount of resources that it now consumes. These resources are finite; therefore healthcare delivery must demonstrate Value For Money (VFM) to ensure available resources are used efficiently and effectively. Cost-effectiveness however is not the only issue. There is now a demand for health services that are accountable, have integrated quality improvement strategies, are sustainable and which respond to patient concerns⁽³⁾.

Concerns about healthcare quality appear to be expressed most often about acute hospitals, which also receive most attention in the media, even though approximately sixty percent of the budget allocation for healthcare is allocated to Primary, Community and Continuing Care (PCCC)⁽⁴⁾. Perhaps this is due to the fact that acute hospitals are where people attend when they require urgent care and subsequently poor quality is more readily identifiable and less acceptable.

When people require urgent care they are very likely to visit the Emergency Department (ED) of their local hospital. Even though urgent admissions consistently account for almost seventy percent of inpatients⁽⁵⁾ and these are more than likely admitted through the ED, only twenty five percent of all patients that present to the ED are admitted. This all adds up to a lot of activity in our EDs, with approximately 3,300 presentations nationally each day. It is therefore important that the service provided by our EDs is of high quality and this can only be determined through an integrated performance monitoring process. In the absence of performance monitoring and benchmarking, good performance will not be recognised and poor performance may go unchecked.

1.3. ED relevant reports

There have been a number of reports published in recent years examining the quality of our health service. Among these are a number of investigations resulting from high profile incidents with major, and sometimes catastrophic, consequences for patients. These investigations are as a result of the provision of poor quality healthcare and include an investigation into circumstances around the provision of care to Rebecca O'Malley⁽⁶⁾ and an investigation into the quality and safety of services at the Mid-Western Regional Hospital, Ennis⁽⁷⁾.

A number of other reports have been commissioned to assist in identifying reasons for substandard service delivery and to contribute to the quality improvement process. In 2001, a value for money report by Deloitte & Touche on the Irish health system⁽⁸⁾ found that there was a lack of agreed standards to support benchmarking of emergency departments and there was a lack of "...consistent, timely, reliable information.." on emergency department activity across the healthcare system.

A Comhairle na nOspideal report⁽⁹⁾ published in 2002 on Accident and Emergency Services identified an urgent need for comprehensive, reliable and comparable data across the health system. Findings included a deficit of system-wide data collection and use, which would be invaluable to clinical and other staff in providing a service to meet the needs of the patients. The report recommended a standardisation of data items and the establishment of the Health Information and Quality Authority to monitor the performance of the healthcare system against key quality indicators.

The Prospectus Report⁽¹⁰⁾ was commissioned in 2002 to determine if the structures and functions of the health service supported health service delivery as proposed by the Department of Health and Children and to make recommendations about accountability between various sections within systems and minimise duplication between organisations. Recommendations include the development of data collection processes and analysis capability, as these are imperative for setting and monitoring standards.

The Tribal Secta A&E Mapping and Efficiency Project⁽¹¹⁾ was commissioned by the National Hospital's Office of the Health Services Executive (HSE) to identify reasons and propose solutions for delays in EDs. The project involved tracking the patient journey from admission to hospital via the ED, through to discharge, in order to identify opportunities for improvement in the management of patient flow. The project also had the objective of highlighting practice that had either a positive or negative impact on the management of patient flow and make recommendations, where relevant. The project report states that wait times in the ED are the result of system wide failures and

bottlenecks rather than inefficiency within the ED. It also found that information and technology were not of sufficient quality to support proper patient management. In particular Patient Administration Systems (PAS) were inadequate for purpose. Performance measurement and comparison were not possible due to poor data definitions for issues such as care episodes, bed allocation and delayed discharges. The report also stated that there was no standardisation in relation to Minimum Data Sets (MDS) to support measurement and comparison.

The ED Taskforce was established by the HSE in March 2006 in an attempt to reduce the number of patients waiting for emergency admission, reduce the length of time that patients had to wait for a bed and improve the experience of patients visiting our emergency departments⁽¹²⁾. The report makes a number of findings and recommendations based on system capacity, capability, and control. Significant findings of the report include that information technology (IT) within emergency departments is poor and information on ED activity is not always used outside the ED by management or clinicians. The report recommends that in order to facilitate the comparison of performance across the system, consistent definitions must be developed to apply to all hospitals. To support the measurement process, IT systems must also be enhanced. The report also recommends that measurement of waiting times should commence for all patients from the time of presentation at the emergency department.

One of the consistent themes from the various reports on the Irish health service, and in particular ED services, appears to be a deficit in data definitions and standards to support the comparison of performance both nationally and internationally and facilitate

benchmarking. There also appears to be inadequate information systems to support data capture and subsequent performance monitoring.

1.4. Objectives of this study

Given the findings of the reports outlined in the previous section and the consistent themes emanating from them, the objectives of this study are:

- To provide an overview of quality in healthcare and methods of monitoring healthcare quality
- To propose a set of guidelines on developing Key Performance Indicators to monitor healthcare quality
- To identify from available literature Key Performance Indicators used to monitor Emergency Departments internationally
- To carry out an impact assessment on systems and processes of capturing data for Key Performance Indicators, chosen as a result of the international review, in a medium sized Emergency Department of an Irish hospital
- To make recommendations based on the findings of the impact assessment

1.5. Methodology

There are two distinctive elements to this dissertation. The first element of the dissertation is to develop a set of generic guidelines for developing performance indicators to monitor healthcare quality based on an extensive literature review. This is to provide guidance to individuals and organisations to select KPIs on the basis of current best practice and to contribute to a standard approach to data collection across the healthcare system. The second element of the dissertation involves carrying out an

impact assessment on systems and processes of implementing KPIs in a medium sized ED in an Irish hospital.

Two indicators have been selected for this project, based on a review of KPIs that are operational internationally. The first KPI is based on waiting times, measured from when the patient is first registered in the ED through to their eventual discharge, transfer or admission to a bed in the hospital (Appendix 1). The KPI measuring waiting times has been chosen as it is widely used in a number of other jurisdictions, facilitates benchmarking and is of significant concern to healthcare staff, patients and the public. The author recognises that total time in the ED is not a specific measure of ED performance, as it is dependent on factors external to the department, such as bed availability. It might therefore be considered to be more of a measure of system performance than departmental performance, but is often perceived by the public as representative of ED performance. To counteract this bias, processes that have been identified by experienced ED personnel as contributing to delays in EDs will be examined, to determine if data that contributes to the explanation for delays can be captured. These additional data will also enable the ED to identify delays caused by factors outside of the department's control and facilitate the separation of system performance from departmental performance.

The second KPI was selected in a Delphi Study carried out by Beattie and Mackway-Jones⁽¹³⁾ in the UK to identify performance indicators that reflect the quality of care in EDs. This is "door to needle time" for thrombolytic therapy in patients diagnosed with acute myocardial infarction (Appendix 2). This KPI is currently being used in the United

States of America and in England for performance monitoring purposes. “Door to needle time” refers to the elapsed time from when the patient first presents in the ED to the time that thrombolysis commenced. The author accepts that not all Emergency Departments routinely care for patients with evolving myocardial infarctions, but the aim of this study is to determine the impact of data collection rather than an assessment of clinical care.

1.6. Dissertation structure

Chapter 2 of the dissertation provides an overview of quality and methods of monitoring healthcare quality. Chapter 3 proposes a set of guidelines for the development of KPIs based on the synthesis and analysis of an extensive literature review. Chapter 4 provides details of performance monitoring in other countries with specific emphasis on Emergency Departments and outlines current data collection processes in Ireland. Chapter 5 outlines the typical patient journey through the ED in order to provide context for the impact assessment, which is also detailed in this chapter. The impact assessment was carried out through semi-structured interviews with five experienced ED personnel. Finally, Chapter 6 contains conclusions and recommendations as a result of the impact assessment.

Chapter 2: Performance Monitoring

2.1. Introduction

In order to monitor quality it is necessary to define quality. This chapter explores the concept of quality and discusses a number of definitions proposed by individuals and organisations that are widely accepted to be experts in healthcare quality. The chapter also outlines some of the most common methods of monitoring healthcare quality, including the role of KPIs.

2.2. Quality

Quality is a complex concept. The perception of quality can often be in the abstract and the measurement of quality frequently thought to be intuitive. This is similar to the Dreyfus Model of Skill Acquisition⁽¹⁴⁾, whereby an expert is deemed to have tacit knowledge to enable them provide optimum care without a reliance on rules or guidelines. This however is not sufficient to meet the demand for a more tangible means to assess the quality of our healthcare service.

Quality assurance is a continuous cycle involving defining quality, monitoring quality and improving quality (Figure 1).

2.2.1. Defining Quality

Defining quality involves setting standards for an acceptable level of performance. According to Øvretveit⁽¹⁵⁾ " A quality health service provides the range of services which meet the most important health needs of the population (including preventative services) in a safe and effective way, without waste and within higher-level regulations". By this he means, that a quality health service provides what people want based on their assessed needs, both efficiently and effectively.

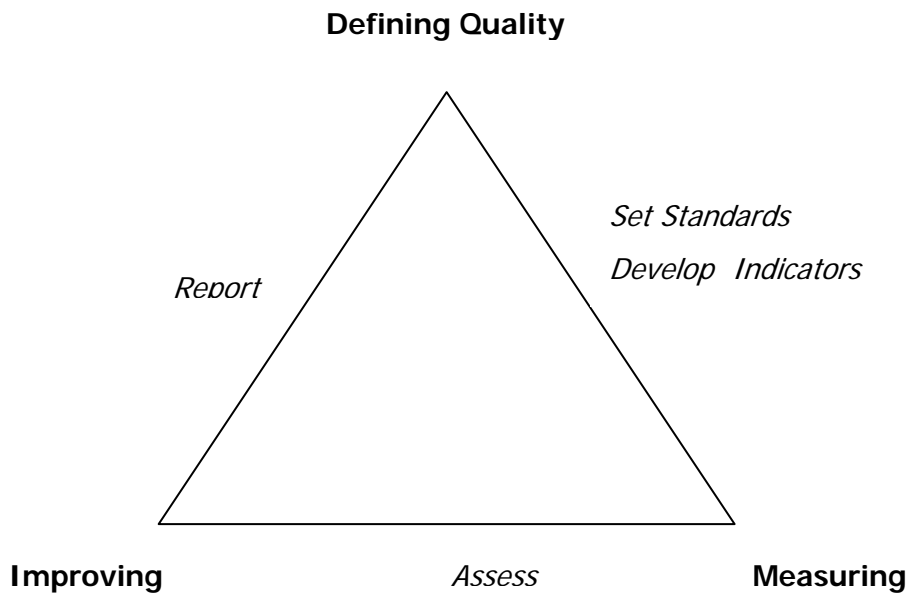


Figure 1: Quality Assurance Triangle⁽¹⁶⁾

According to Donabedian⁽¹⁷⁾ healthcare quality is the combination of “the science and technology of health care and the application of that science and technology in actual practice”. Providing quality healthcare involves providing care that is accepted as best practice at the time of delivery using available technology and resources. A more widely accepted definition for quality in healthcare has been proposed by the US Institute of Medicine⁽¹⁸⁾ as “the degree to which services for individuals and populations increase the likelihood of desired outcomes and are consistent with current professional knowledge”. McGlynn⁽¹⁹⁾ explains that this definition recognises a scale of performance which can theoretically range from poor to excellent, identifies that monitoring can involve both individual and population perspectives and that efforts to improve health outcomes must be based on scientific evidence or on the consensus of experts in the absence of scientific evidence.

2.2.2. Monitoring Quality

As stated previously, quality is a complex concept and this is supported by the variety of definitions to be found in the literature; hence, monitoring quality will pose many challenges. Monitoring quality involves evaluating current performance, including patient perspectives, against a standard or expected level of performance. This consists of defining indicators, developing information systems and the analysis and evaluation of results⁽¹⁶⁾.

It is important that there is a defined purpose for monitoring. The main reason for monitoring healthcare quality is to identify opportunities to improve performance where it has been identified that performance is not at the desired standard⁽¹⁷⁾. The ability to monitor and report on quality is accepted as a basis for improvement in the delivery of healthcare. Data collected for monitoring purposes assists healthcare providers to improve performance through benchmarking, empowers consumers to make informed decisions and facilitates system wide quality improvement by informing national policies^(20;21). KPIs can be used to measure performance through benchmarking and identify areas for detailed attention in the assessment process and may even prompt risk-based assessments.

2.2.3. Improving Quality

Improving quality involves closing the gap between current performance and the expected level of performance. This can be achieved by analysing the results of the monitoring process to recognise and address shortcomings and enhance identified strengths⁽¹⁶⁾.

2.3. Dimensions of quality

In order to monitor the quality of the healthcare system it must be determined what aspects should be measured. The Organisation for Economic Cooperation and Development (OECD) is an intergovernmental economic research institute established in 1961 and has membership of 30 developed countries, including Ireland. The organisation launched the Health Care Quality Indicator (HCQI) Project in 2003 to build on previous initiatives to identify quality indicators for international comparison and to set priority areas for additional indicator development.

The OECD HCQI project has identified the most common dimensions of healthcare performance, assessed in a number of countries. Dimensions of healthcare performance are “..... those definable, preferably measurable and actionable, attributes of the system that are related to its functioning to maintain, restore or improve health⁽²²⁾. According to the OECD⁽²³⁾ the most commonly used performance dimensions of healthcare are:

- **Safety:** The degree to which health care processes avoid, prevent, and ameliorate adverse outcomes or injuries that stem from the processes of health care itself⁽²⁴⁾.
- **Effectiveness:** The degree of achieving desirable outcomes, given the correct provision of evidence-based healthcare services to all who could benefit, but not to those who would not benefit⁽²⁵⁾.
- **Responsiveness/Patient-centeredness:** Responsiveness refers to meeting peoples legitimate expectations and patient-centeredness refers to care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions.

- **Accessibility:** The ease with which patients can access health care.
- **Equity:** Care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.
- **Efficiency:** Best use of available resources to attain optimal results.

A number of other dimensions have been identified but are less commonly used, such as Acceptability, Appropriateness, Competence, Continuity and Timeliness.

2.4. Methods of monitoring and improving quality

There are a number of means through which the performance and quality of healthcare organisations can be monitored and improved⁽²⁶⁾. The following are some examples of methods of monitoring quality that can be used either individually or in combination:

1. Regulatory inspection
2. Surveys of consumer experiences
3. Third-party assessments
4. Performance indicators

2.4.1. Regulatory inspection

This involves the inspection of organisations by regulatory authorities to assess compliance with licensing regulations. It has been described as “.... the sustained and focused control exercised by a public agency over activities which are valued by a community”⁽²⁷⁾. The standards against which organisations are inspected are often based on minimum legal requirements to care for patients.

2.4.2. Surveys of consumer experiences

Consumer surveys assess the experience of healthcare delivery as perceived by the patient or their family. This is gaining in popularity as healthcare focuses on empowering the patient through health education and informing patients of the expected level of performance.

2.4.3. Third-party assessments

Third-party assessments are often voluntary and usually combine internal self-assessments with external audits and include International Organisation for Standardisation (ISO) certification, peer review and accreditation.

Certification against ISO standards involves monitoring compliance with quality systems rather than hospital performance and usually involves measuring aspects of the organisation, such as the laboratory system.

Peer review is a form of professional self-assessment, usually done to gain recognition as a training facility. It involves professionals visiting from an external organisation to peer review other professionals from their own discipline.

Accreditation involves measuring hospital performance through self-assessment, external review by a multi-disciplinary team and benchmarking with selected indicators. Accreditation is usually done for the purpose of organisational development rather than regulation⁽²⁶⁾.

2.4.4. Performance Indicators

Performance Indicators are specific and measurable elements of practice that can be used to assess quality of care⁽¹⁾. Indicators are measures of performance based on standards determined through evidence-based academic literature or through the consensus of experts when evidence is unavailable. According to the Joint Commission on Accreditation of Healthcare Organisations (JCAHO) in the US, performance indicators are not intended to be direct measures of quality, instead they act as alerts to warn of opportunities for improvement in the process and outcome of patient care⁽²⁸⁾.

2.5. Performance Indicators for Healthcare Quality assessment

As previously stated, measuring and evaluating the quality of healthcare has been driven by the recognition that there are variations in the quality of healthcare delivered, and concerns about the cost associated with poor quality healthcare⁽²⁹⁾. Together with quality improvement, measurement also contributes to learning, regulation and accountability and assists healthcare staff in their quest to provide optimal care⁽³⁰⁾. However, in order to measure healthcare quality, it is necessary to be able to monitor it, and this can be done with the assistance of performance indicators⁽²⁵⁾. Performance indicators facilitate the capture of healthcare trends as a quantitative measure of quality. They make an inference about the quality of care provided and indicate areas that may require further scrutiny⁽³¹⁾.

According to Avedis Donabedian,⁽¹⁷⁾ healthcare quality can be assessed using a tripartite model based on the Structures, Processes and Outcomes of the healthcare system.

Structure/Process/Outcome

- *Structure* relates to the attributes of the health system that contribute to its ability to meet the healthcare needs of the population. Structural indicators refer to the resources utilised by an organisation to deliver healthcare and includes buildings, equipment, qualified healthcare personnel and available finances.
- *Process* relates to what is actually done for the patient and how well it was done. Process indicators measure the activities carried out in the diagnosis and treatment of patients and are often used to measure compliance with recommended clinical practice based on evidence or the consensus of experts.
- *Outcome* relates to the state of health of the individual or population resulting from their interaction with the healthcare system. It can also include lifestyle improvements and increased level of knowledge. Outcomes can be expressed using the five Ds⁽³²⁾:
 - Death: considered a poor outcome if untimely
 - Disease: signs, symptoms and test results
 - Discomfort: including problems such as pain, nausea and dyspnoea
 - Disability; limitations in home, work or recreational activities
 - Dissatisfaction: emotional responses to disease or its care

Donabedian also stated that these three categories are interdependent and that good structure promotes good processes and good processes promote good outcomes. The measurement process can be assisted through the use of performance indicators to

capture a variety of selected factors and trends of both health and the healthcare system⁽²⁵⁾.

2.5.1. Types of Indicators

Performance indicators for healthcare can be characterised according to whether they are disease specific or generic and by both the type of care and function of care for which the measurement is intended (Figure 3).

Generic or disease-specific

- *Generic indicators* measure aspects of care pertinent to the majority of patients regardless of illness. An example of a generic indicator is the number of patients awaiting admission from the emergency department for more than four hours.
- *Disease-specific indicators* are related to a specific disease and measure particular aspects of care related to that disease process. An example of a disease specific indicator is the proportion of patients with diabetes mellitus that are reviewed by an ophthalmologist annually.

Type of care

Indicators can be classified according to the type of care for which the measurement process was developed; preventive, acute or chronic.

Function of care

Indicators can be classified according to the function of care, which can be screening, diagnosis, treatment and follow-up.

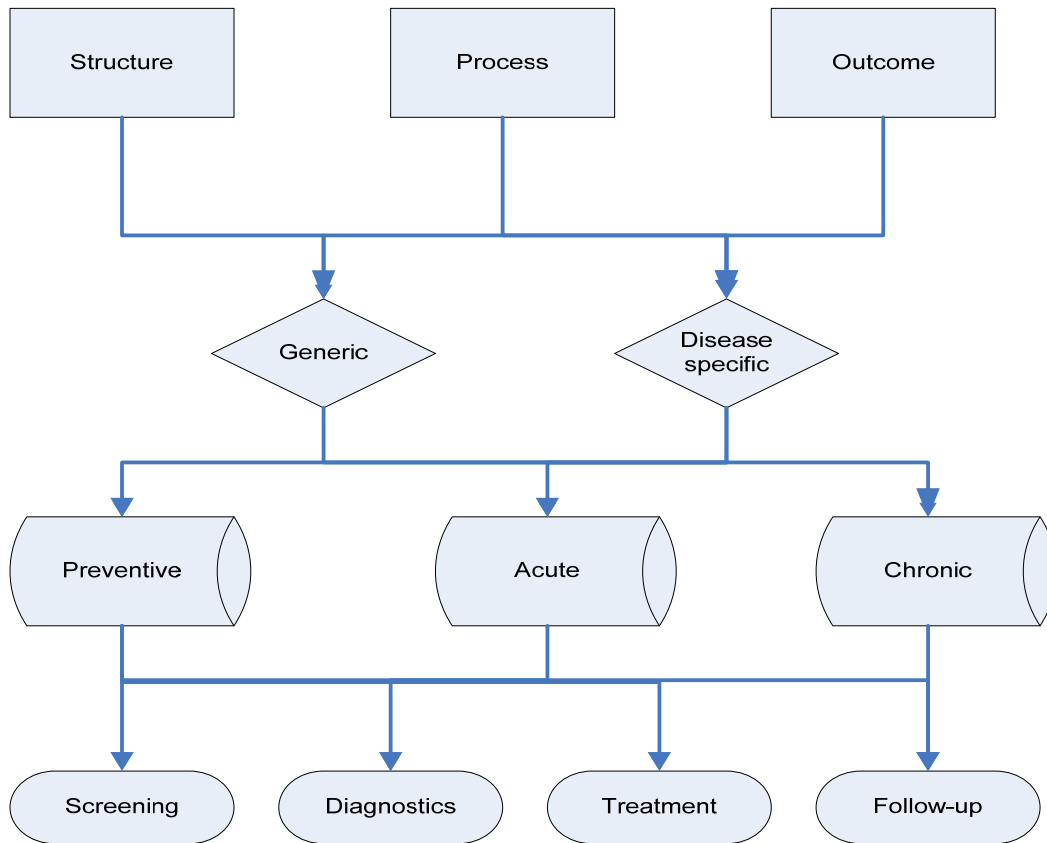


Figure 2: Types of Indicators

Figure 2 (above) outlines the many steps and pathways that need to be considered when choosing an indicator and demonstrates that the final indicator can be a combination of different classifications of indicators.

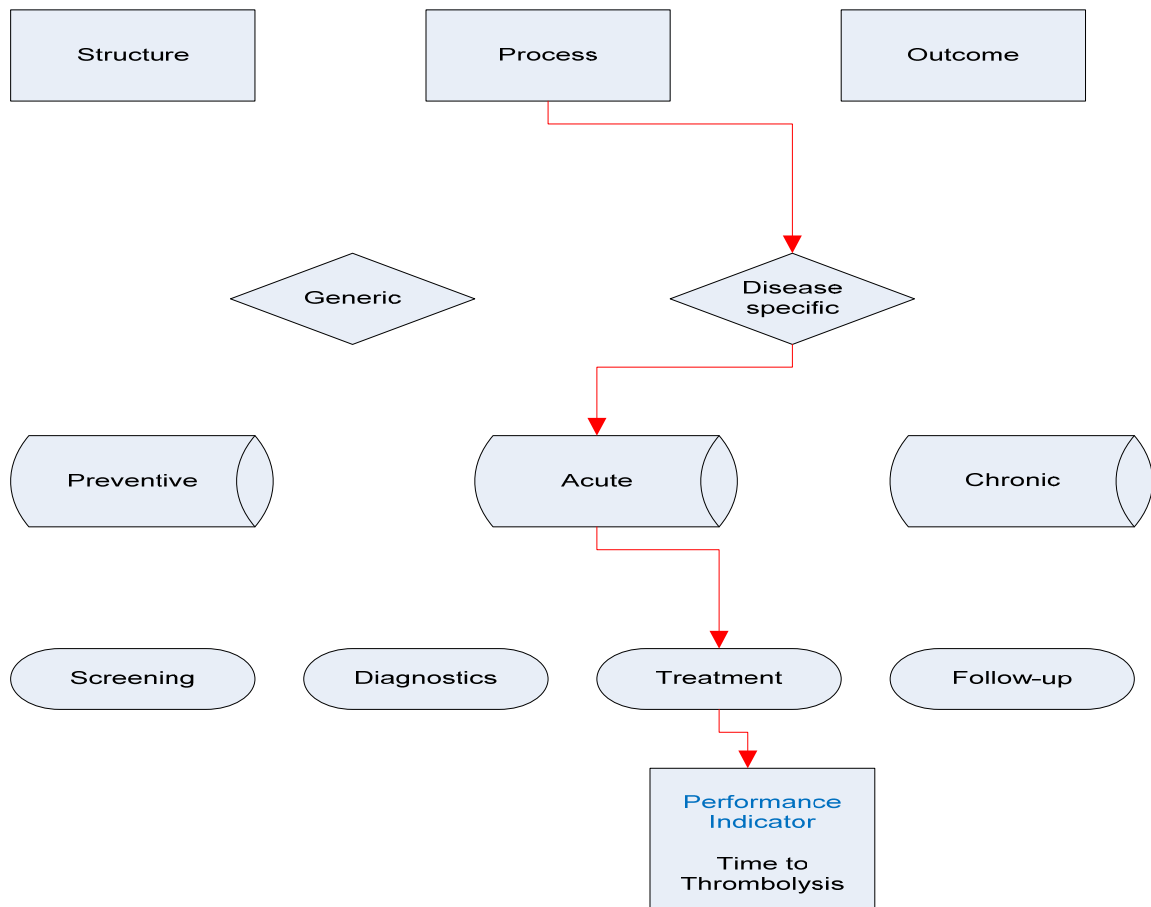


Figure 3: Example of an indicator

Figure 3 (above) illustrates the path taken for a selected indicator, time to thrombolysis, which is a process indicator that is disease specific. The type of care is 'acute' and the function of care is 'treatment'.

2.6. Risks

Even though performance indicators represent a standard method of performance monitoring, there are many risks associated with their use. The result of the measurement needs to be interpreted based on the quality of the data and the definitions that constitute the indicator and the minimum data set. If the definitions are

not explicitly stated or there are no checks to verify the quality of the data, then organisations may not be accurately recording activity and benchmarking will be impossible.

Not all organisations have an equivalent patient population and therefore case-mix needs to be incorporated into the performance indicator to account for variations that may be demonstrated by presenting raw data. Variations in the patient population such as age, gender, co-morbidity and severity of disease can account for variations in the results of the measurement process. Also, healthcare outcomes are usually the result of a combination of factors and it is important that the indicator is measuring outcomes that are attributable to the performance of the healthcare system⁽³³⁾.

Another significant risk is the temptation to select or develop an indicator based on available data. Basing indicators on what the organisation considers an intrinsic component of a quality service will lead to measurements that enhance quality within the organisation. Basing indicators on available data may lead to measurements that do not contribute or have a negative impact on quality improvement. It is however important to identify what information is available with the aim of identifying significant gaps.

National targets may allow benchmarking internationally, but they provide little information as to why there are variations in results⁽³⁴⁾. National indicators need to be supported by local operational indicators to provide information at a local level to inform practice.

It is important for healthcare providers to recognise that indicators have the potential to identify where there are variations in quality, but not why this variation exists⁽³⁵⁾. Performance indicators are not intended to be a true measure of quality, but they act as a flag or signal that further investigation may be warranted. An example of this occurred in the United Kingdom in 2007 when the Healthcare Commission became aware of high mortality rates in one of its Acute Trusts in comparison with other Trusts⁽³⁶⁾. It was only on further investigation that the Commission were able to determine the reasons behind the high level of mortality, which included understaffing, poor equipment in the ED, lack of training for staff, and poor patient care, among other things. The investigation occurred because performance indicators had flagged the high mortality rate associated with this specific group of patients.

Performance data captured at the point of care can be utilised locally to involve and inform clinicians. Healthcare performance data needs to be of relevance to the healthcare provider and must not divert resources from the primary purpose of providing healthcare. In the United Kingdom the Healthcare Commission developed the Better Metrics project⁽³⁷⁾ in response to the recognition that clinicians were not always aware of targets being used in performance measurement. The project aim was to develop metrics that are relevant to clinicians' day-to-day practice and assist local services develop their own metrics.

An individual or limited number of indicators will not provide sufficient information for measuring performance and may encourage organisations to focus on the activity being measured to the detriment of the service as a whole; leading to a 'what gets measured

gets done' situation⁽³⁵⁾. The set of indicators must provide a comprehensive view of the service without placing an excessive burden on organisations to collect data.

Chapter 3: Development of Performance Indicators

3.1. Introduction

In an effort to optimise the quality of performance indicators, the author proposes a systematic approach for the development process. A number of steps have been identified from literature⁽³⁸⁻⁴⁰⁾ and these steps are further elaborated in this chapter using an analysis and synthesis of information obtained during the extensive literature review. These steps are intended to be a guide for individuals and organisations to develop indicators that are valid and reliable by ensuring the indicators are fit for purpose. A high level overview of the development process is detailed in figure 4 (below).

3.1.1. Define the audience and use for measurement

The first step in the indicator development process is defining the goals of the measurement, reasons for measurement and the intended audience.

Whether the goal of the measurement is for benchmarking, either internally for quality improvement purposes or externally against other organisations or standards, will influence the indicator selection process.

There are a number of identified dimensions of quality and subsequently there can be numerous indicators, each measuring different domains. Before embarking on the performance measurement process it is necessary to identify the particular domain for which the measurement is intended, which may in turn be dependent on the audience.

The intended audience will influence the unit of analysis. The audience can be the patient, the clinician, the public, the facility or the healthcare system. For example a

patient waiting for surgery will be more interested in the average waiting time for that surgery, rather than the number of people on the waiting list.

Once these elements have been defined, it will allow the team to focus on particular aspects of care.

3.1.2. Consult with stakeholders

The project team should ensure that there is consultation with all stakeholders throughout the data development process.

Consultation from the outset of the process facilitates stakeholder engagement and assists in obtaining valuable input. Consultation also facilitates agreement about data elements and assists in familiarisation with the data and standards⁽⁴¹⁾.

Consultation with decision-makers can identify their information needs and subsequent use for that information. Consultation with service providers will also assist in identifying their information needs, and elicit what data they can provide. Discussions with data capture and analysis staff can assist in determining skills base and training requirements. Service user engagement can assist in identifying their information needs and if the proposed data collection process raises any privacy and confidentiality concerns⁽⁴²⁾.

Consultation should include ongoing engagement and eventual endorsement by national or regional committees that have responsibility for health information and standards.

Methods of consultation can vary from once-off meetings to regularly scheduled meetings and even web forums. The chosen method should be based on the most efficient method of communicating with the intended audience to disseminate the

desired information and obtain the required feedback. Consultation should facilitate the project team obtain guidance from all stakeholders and in particular from the expert panel.

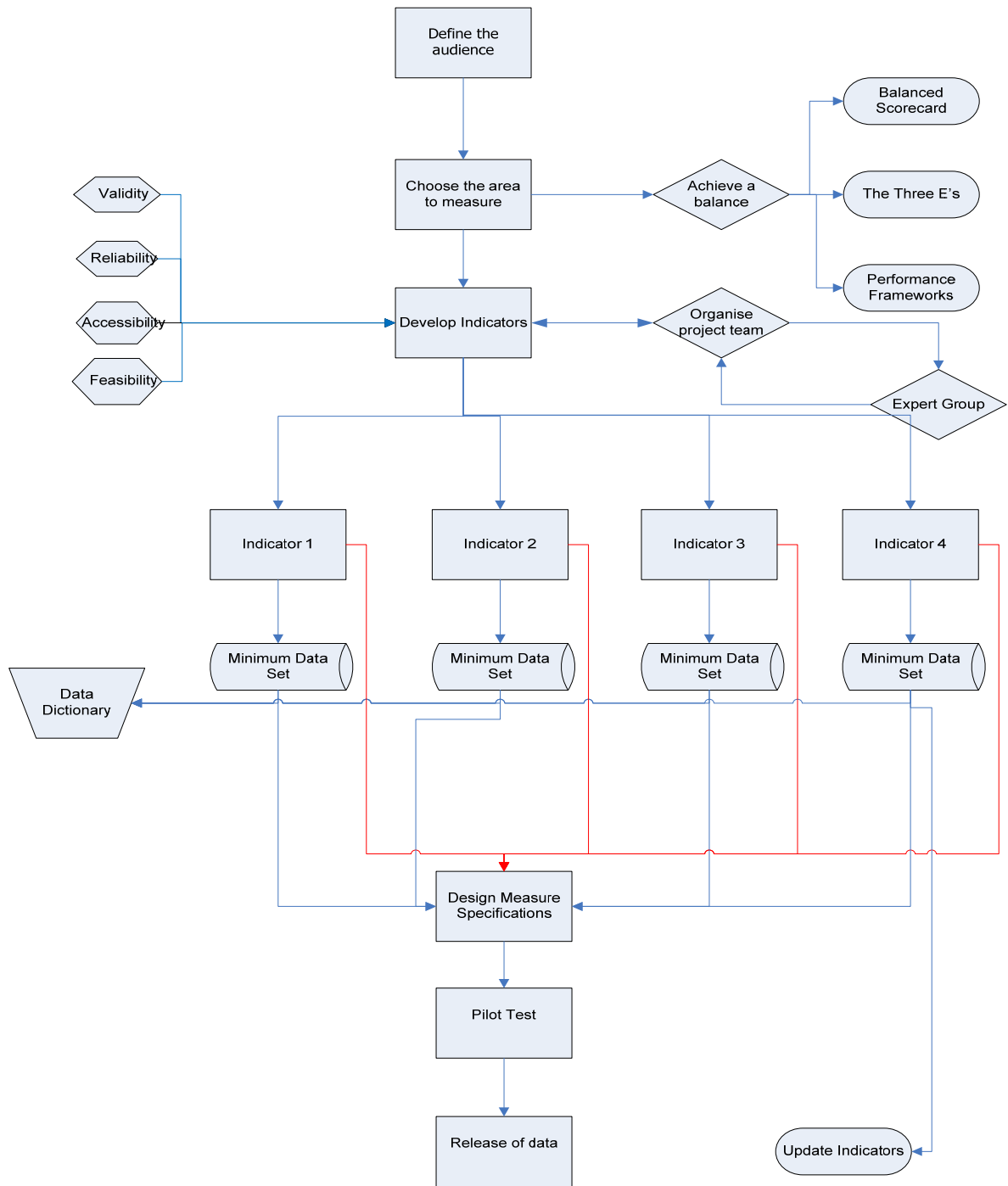


Figure 4: Overview of development process

There should be a protocol developed to provide an opportunity for written comment from interested parties prior to the conclusion of the data development process.

3.1.3. Choose the area to measure

Choosing the area to be measured should be based on the importance of the healthcare problem, patient safety, potential for improvement and controllability by health system/professionals.

A healthcare problem is important if it is associated with significant morbidity and mortality, has high volumes and is costly to treat⁽³⁸⁾. Morbidity and mortality can be determined by epidemiological data, including mortality rates and disease prevalence. The importance of a healthcare problem can also be determined by utilisation rates associated with a particular condition.

Patient safety should be paramount in the delivery of healthcare and is recognised as a dimension of healthcare quality⁽⁴³⁾. While patient care is delivered by individuals, indicators that identify patterns and trends can demonstrate the need for improvement in systems together with individual learning⁽⁴⁴⁾. Patient safety indicators can be generic, measuring standardised mortality rates and adverse events or they can be more specific, measuring healthcare associated infection, preventable surgical complications and medication safety⁽⁴³⁾. Other patient safety indicators monitor adverse events such as falls and bedsores.

As it is not possible to monitor all aspects of health care delivery, priority should be given to conditions for which there is evidence to support potential for improvement.

Areas that have demonstrated variability in the quality of care or where there is a clear gap between actual and potential levels of health should be considered⁽⁴⁵⁾. The process or outcome measure being assessed should be susceptible to influence by the health care system in relation to quality improvement⁽³⁹⁾. The health care system should have the ability to address the problem being measured and likewise the measure should reflect policy/practice changes.

Together with the clinical reasons for collecting data are issues such as the cost of collecting the data versus the savings that can be made by improvements resulting from the measurement process.

3.1.4. Achieve a balance

The selection of performance indicators should focus on key strategies and priorities of the organisation and the final set of indicators should reflect a comprehensive view of the overall performance of the organisation.

The diversity of stakeholders requires that there is a need for measures across multiple dimensions to comply with their information needs⁽⁴⁶⁾. A number of approaches have been developed to assist in identifying a balanced set of indicators including:

- The balanced scorecard originally developed by Kaplan and Norton⁽⁴⁷⁾ suggests four perspectives of an indicator set to provide a comprehensive view of the performance of an organisation:
 - ***Service user perspective*** measures how an organisation meets the needs and expectations of the service user.

- ***Internal management perspective*** measures the key business processes that have been identified as necessary for a quality and effective service.
- ***Continuous improvement perspective*** measures the ability of the organisation's systems and people to learn and improve
- ***Financial perspective*** measures the efficient use of resources to achieve the organisations objectives.
- The 'Three Es' framework⁽³⁵⁾ uses the three dimensions of economy, efficiency and effectiveness.
 - ***Economy*** measures the acquisition of human and material resources of the appropriate quality and quantity at the lowest cost.
 - ***Efficiency*** measures the capacity to provide effective healthcare using minimum resources.
 - ***Effectiveness*** measures the degree to which the organisation attains established goals.
- Performance frameworks identify dimensions of healthcare performance that can be used as a basis for the development of performance indicator sets. The Organisation for Economic Cooperation and Development (OECD) have developed the Health Care Quality Indicator (HCQI) Project for the purpose of identifying a set of indicators that can be reported across countries using comparable data⁽⁴⁸⁾. The conceptual framework takes the most common dimensions of care from a number of participating country frameworks and incorporates them in to a model for healthcare performance assessment (See Appendix 3)⁽²²⁾.

- In the United Kingdom the performance assessment framework measures performance in six main areas: health improvement; fair access; effective delivery of appropriate care; efficiency; patient/carer experience; and health outcomes.

The process of achieving a balanced set of indicators can also be assisted by incorporating the Structure, Process, Outcome classification into the methodology for assessing the healthcare system. As stated previously these classifications are interdependent and structure can have an impact on processes, which in turn can have an impact on outcomes.

3.1.5. Organise the project team

A multidisciplinary team and advisors representative of different perspectives of healthcare should be established to oversee the indicator selection process.

The project team membership should reflect the relevant health professionals and stakeholders for the area being measured. This may involve the inclusion of a patient representative; however the level of involvement will depend on the nature and clinical complexity of the indicators. Consideration should also be given to have representation from personnel that deliver the service and from those that collect/record the data, including database managers.

Clinician membership should be multidisciplinary and be recognised and respected within their professions. This will enhance confidence in the validity of indicators and will increase the likelihood of acceptance by professionals in the area being evaluated.

The project team should include epidemiologists or healthcare quality experts with experience in epidemiology, to ensure that the data collection and analyses methodology

is reliable and valid. If it is not feasible for these to be included in the team then the team should, at the minimum, have access to their expertise in an advisory capacity. The team should also have access to administrators responsible for resource distribution for the topic area within the healthcare system.

For national projects, the team should include membership from different geographical regions; however the team should be kept relatively small. For example, the Danish National Indicator Project, groups consisted of 8 to 15 members representing healthcare professionals relevant to the care of each condition such as physicians, nurses, physiotherapists, dieticians, etc. The team included representation from clinical and scientific aspects of the condition and also included a project manager, project coordinator, an epidemiologist and a person with responsibility for literature searches⁽⁴⁹⁾. Input can also be derived through the ongoing stakeholder engagement process, running in parallel with the project.

3.1.6. Define the selection criteria

Performance Indicators should be chosen based on the judgement and consensus of experts and potential users⁽⁵⁰⁾.

Table 1 outlines a list of characteristics and related questions to assist in identifying performance indicators. These questions can assist in identifying indicators during the development process but can also be used for testing the indicators once they have been developed.

- Validity – a valid indicator measures what it is supposed to measure and captures an important aspect of quality that can be influenced by the healthcare facility or system.

Ideally indicators selected should have links to processes and outcomes through scientific evidence. Measures that have been selected using scientific evidence possess high content validity and measures selected through consensus and guidelines will have high face validity.

Face validity can be determined if the indicator making sense logically and clinically or from previous usage. Content validity refers to whether the indicator captures important aspects of the quality of care provided.

Table 1: Selection Criteria⁽⁴²⁾

Validity	Does the indicator measure what it is supposed to measure?
Reliability	Does the indicator provide a consistent measure?
Explicit evidence base	Is the indicator supported by scientific evidence or the consensus of experts?
Acceptability	Are the indicators acceptable?
Feasibility	Is it possible to collect the required data and is it worth the resources?
Sensitivity	Is the component being measured within the influence of the service provider and are small changes reflected in the values?
Specificity	Does the indicator actually capture changes that occur in the service being measured?
Relevance	What useful decisions can be made from the indicator?
Balance	Do we have a set of indicators that measure different aspects of the service?
Timeliness	Is the information available within an acceptable period of time to inform decision-makers?
Data capture	How, when and where will the necessary data be captured?

- Reliability – the indicator should provide a consistent measure in the same population and settings irrespective of who performs the measurement.

Reliability is similar to reproducibility, to the extent that if the measure is repeated, either by the same person or by somebody else, you should get the same result. Any variations in the result of the indicator should reflect actual changes in the process or outcome. Reliability can be influenced by training of data collectors, poor indicator definitions and the precision of the data collection methods⁽⁴⁰⁾.

Inter-rater reliability compares differences between evaluators performing the same measurement. Internal consistency examines the relationship between sub-indicators of the same overall measurement, and, if reliable, there should be correlation of the results. Test-retest reliability compares the difference between results when the same evaluator performs the measurement at different times.

- Explicit evidence base – Clinical indicators should be based on scientific evidence, consensus of expert opinions among health professionals or on clinical guidelines.

The preferred method of choosing indicators is through evaluating scientific evidence in support of each indicator and rating the strength of that evidence. One example of a rating system is to give the highest rating to evidence ('A' evidence) from meta-analysis of randomised controlled trials and give a lesser rating ('B' evidence) to evidence for controlled studies without randomisation and a further lower rating ('C' evidence) to data from epidemiological studies⁽³⁹⁾.

In health care there may only be limited scientific evidence to support an indicator and it becomes necessary to avail of expert opinion⁽³¹⁾. There are a number of methods by which an indicator can be developed through facilitating group consensus from a panel of experts, including:

- The Delphi technique is a facilitated structured process whereby a panel of experts complete questionnaires remotely and, through feedback and scoring (see Appendix 4) over a number of rounds where some indicators are discarded, a consensus is achieved on a final set of indicators. The panel need not ever meet face to face and each individual's feedback is provided anonymously to the panel, which eliminates the possibility of undue influence by dominant personalities within the panel.
- The RAND appropriateness method combines scientific evidence with expert opinion by facilitating experts to rate, discuss and re-rate indicators. Unlike the Delphi technique the expert panel meet face to face to discuss possible indicators and are given a copy of the scientific literature in support of the indicators, so that they can ground their opinion on evidence-based literature⁽³¹⁾.
- Indicators can also be developed based on clinical guidelines. An acceptable method of developing indicators using guidelines is the iterated consensus technique whereby indicators are selected based on the perceived impact of the guideline on the outcome of care⁽³¹⁾.

The expert panel can exist independently of the project team and are used as a point of reference for the indicator development process.

- Acceptability – the data collected should be acceptable to those being assessed and to those carrying out the assessment.
- Feasibility – there should be a feasibility analysis carried out to determine what data is currently collected and the resources required to collect any additional required data.

The feasibility analysis should determine what data sources are currently available and if they are relevant to the needs of the current project. This will include determining if there are existing performance indicators or benchmarking processes based on these data sources.

The reporting burden of collecting the data contained in the indicator should not outweigh the value of the information obtained. Preferably data should be integrated into service delivery, and, where additional data are required that are not currently part of service delivery, there should be cost benefit analysis to determine if it is cost-effective to collect.

The feasibility analysis should also include what means are used to collect data and the limitations of the systems, if any, used for collection. It should also outline the reporting arrangements, including reporting arrangements for existing data collection and frequency of data collection and analyses.

- Sensitivity – changes in the component of care being measured should be captured by the measurement process and reflected in the results.

The performance indicator should be capable of detecting changes in the quality of care and these changes must be reflected in the resulting values.

- Specificity – only changes in the area being measured are reflected in the measurement results.
- Relevance – the results of the measurement should be of use in planning and the subsequent delivery of healthcare
- Balance – the final suite of indicators should measure different aspects of the service in order to provide a comprehensive picture of performance, including user perspective⁽³⁵⁾.
- Timeliness – the data should be available in the form of reports within a time period that enables decision-makers utilise the data to inform their decision-making process. If the information is required for operational purposes, then it will be required within a shorter timeframe than information used for long term strategic purposes.
- Data capture – there should be a determination of how, when and where the required data will be captured.

3.1.7. Define the indicator

The indicator should have a clear definition.

A clear definition ensures that the indicator is appropriately interpreted by those with responsibility for collecting the data (see Appendix 1 & 2). The definition should not be too complex, too tight or too broad, so that only the desired information is collected⁽³⁵⁾. Including the rationale for the measurement will provide context and highlight the importance of the subject being measured.

The definition should incorporate whatever aspect of the healthcare system is being measured; structure, process or outcome. It should clearly identify whether the indicator is generic or disease specific and also identify the type of care and the function of care being assessed.

3.1.8. Identify the target population

The project team should provide a clear definition of the sample group that are considered representative of the population being measured.

The calculation and presentation of results requires that the target population are clearly identified. The target population is called the denominator and includes all patients or events that qualify for inclusion in the measurement process. The subset of the target population that meet the criteria as defined in the indicator are called the numerator. For example, when measuring the percentage of patients that receive thrombolytic therapy within 60 minutes of presenting to the emergency department following a myocardial infarction; the denominator includes all patients that receive thrombolytic therapy following presentation to the emergency department with Acute Myocardial

Infarction and the numerator includes all of the patients within that group that received thrombolytic therapy within 60 minutes. More specific information regarding the target population can be given under the headings Inclusion Criteria and Exclusion Criteria. Inclusion Criteria outlines specific parameters of the population for inclusion in the Numerator and/or Denominator that may not have been included in the indicator definitions. Exclusion Criteria describes the specific criteria for excluding cases from both the Numerator and Denominator. For example, a metric measuring the rate of caesarean sections to determine if it is an overused option would exclude abnormal presentations, multiple gestations, foetal deaths, etc. from the denominator as these are recognised reasons for caesarean delivery and will not contribute to determining if the procedure is overused.

Tracer conditions can also be used to identify the target population, particularly when searching electronic records and in the above example the tracer condition is Acute Myocardial Infarction. Using a tracer condition broadly identifies the target patient population, but a more detailed definition of the target population will be specified by the indicator definition. The tracer condition should also include synonyms, ICD and SNOMED codes where applicable (see Appendix 2).

3.1.9. Define the target to be achieved

Determine a target in conjunction with stakeholders.

There should be a target set to inform progress towards an acceptable level of performance and also to challenge the organisation or service to improve. According to Sutherland and Leatherman⁽⁵¹⁾ there are four distinct purposes for setting targets:

- To motivate towards a common goal

- As a management tool to
 - operationalise policy,
 - achieve agreement and promote discussion regarding priorities and expectations,
 - set benchmarks and monitor progress
 - as a means for performance contracting
- To communicate to stakeholders regarding priorities and expectations
- To hold decision-makers accountable

Targets should be realistic and at the same time challenging, and also they should be SMART, that is, Specific, Measurable, Achievable, Relevant and Time-bound. For example patients presenting with myocardial infarction should receive thrombolytic therapy within 60 minutes of calling for professional help, where that is the treatment of choice. However not all patients with myocardial infarction should receive thrombolysis, as some patients undergo alternative treatment such as primary angioplasty. Therefore the target should be based on an agreed acceptable level of performance that can be achieved incrementally over a specified timeframe.

3.1.10. Threshold for action

Determine maximum or minimum values that should trigger action.

Determining a threshold for action assists in deciding when it is appropriate or necessary to institute changes in response to the measurement. The threshold should be negotiated with the service provider and will depend on the resources and level of service available.

3.1.11. Action

Determine what actions should be taken based on measurements.

Unless actions are taken based on results, the measurement process will become an end in itself. There should be an agreement reached with stakeholders for actions in response to performance indicator results. There may be a series of incremental actions depending on the variation of the result from the target. This may be done by the organisation responsible for the monitoring process if the KPIs are national or by hospital management if the KPIs are used locally to identify opportunities for improvement.

3.2. *Develop the Minimum Data Set (MDS)*

Once indicators have been developed, it is necessary to determine what minimum data are required in order to operationalise the indicator. This should be achieved by creating a Minimum Data Set and is based on what is feasible.

Data is a collection of facts, figures and measurements. Information is data in context; it is data that has been processed and analysed. Numerous errors and adverse events have been attributed to poor quality data and information⁽⁵²⁾. It is therefore important that the data from which information is derived is of good quality, otherwise the quality of information on which decisions are based will be compromised. Data of good quality contributes to improvements in patient safety, facilitates information exchange and supports benchmarking and performance monitoring⁽⁵³⁾. The process of developing the Minimum Data Set for KPIs presents an opportunity to enhance the prospect of collecting good quality data to support the measurement process.

A Data Set has been described as a set of data that is collected for a specific purpose and a Minimum Data Set (MDS) is the core data identified as the minimum required for that purpose⁽⁴¹⁾.

The project team should develop the Minimum Data Set based solely on the essential information required to operationalise the indicator. The MDS should be incorporated into the Data Dictionary to ensure the data is clearly defined and values are agreed. As data collection can involve the use of additional resources, it is therefore essential that only the minimum amount of data are gathered to enable decision-making⁽⁴²⁾.

3.2.1. Define the level of health information

Ideally, the required data should be routinely collected during service delivery. It should have been determined during feasibility testing if available data meets the requirements of the measurement process or if there is a need to collect additional data.

Data is collected during the delivery of healthcare in order to manage care. This data is then processed at different levels within the healthcare system according to the needs of the system and the purpose of the information.

- Episode-level - episode level information is necessary to facilitate the management of care for each individual service contact. Episode level data records details of a service user's journey through the health service and includes information such as socio-demographic details, referral details, and clinical details. Episode level information is based on the concept of an 'episode of care' which commences at the first contact with the service and is a means of describing and recording relevant information in relation to the care provided to an individual service user during a defined period of time. A unique identifier is necessary in order to report episode-level information.

- Case-level - case-level information is necessary to facilitate the management of care for each individual service user. Case-level information is an aggregate of all the episodes an individual service user has during a reporting period and is derived from episode-level data.
- Facility-level - facility-level information is necessary to facilitate the management of the service facility. Facility-level information includes data relating to the facility such as number of beds, staffing, expenditure and also includes episode-level data.
- System-level - system-level information is necessary for policy and planning purposes on a system-wide or national basis. System-level information is an aggregate of all data elements in a particular region and is derived from episode, case and facility-level information.

Frequently the indicator requires that information will be processed from different levels using a combination of data during analysis to achieve a measurement. For example episode level information will need to be combined with facility level information to determine the ratio of emergency physicians to the number of attendees at an emergency department. In this example, episode level information will be collected for each patient visit and facility level information need only be collected on an annual basis.

3.2.2. Define the frequency of collection

Determine the frequency of data collection.

The urgency of decisions to be made based on the indicator or the level of monitoring required will determine the frequency of data collection. Some data may need to be collected on a daily basis and others will suffice annually. The frequency of data collection will be determined by the level of health information, as outlined in the previous section. Episode level data will be collected daily, whereas system level data may only be collected annually.

3.2.3. Document the data collection process

It is necessary to write detailed data collection specifications to ensure that data are collected and measured consistently and to reduce the risk of bias.

There should be a data development process resulting in data standards that contribute to a consistent approach to data collection and use. Data standards assist in the process of ensuring data collection is of high quality and enable consistent and comparable reporting of data and information⁽⁵⁴⁾.

Data can be collected manually, electronically or by a combination of both. Methods of data collection need to be explored with the group to determine the feasibility of the indicator and answer the following questions:

- Can existing data sources be used? During the feasibility analysis existing data sources will have been identified and where possible these should be utilised. However if an existing data source does not meet the needs of the project, then it should not be used.

- Can existing data sources be enhanced? If the existing data source provides data closely aligned with the required data but not completely fulfilling the requirements, it may be possible to enhance the existing data source. Before enhancing an existing data source it is necessary to consult with others using the data source to ensure the modification does not impact on other uses for the data.
- Is a new method of data collection needed? If a new data source is required it should be determined that the reporting burden does not exceed the benefits gained from collecting the data.

3.2.4. Identify data sources

The most likely data sources are administrative databases, medical records, prospective clinical data and survey data. The most efficient way to collect data is to incorporate the collection process into routine patient care, and “collect once, use many times”, whereby data collected to support the provision of care is also used for administrative and monitoring purposes. This involves standardising documentation to ensure the required information is already being recorded for clinical purposes. The following are some examples of data sources:

- Administrative databases are readily available and therefore will involve minimal expenditure for data collection. However the information may not be specific enough and may not be reliable.
- Medical record data are also readily available and contain more detail than administrative data, including diagnosis, treatment and outcome.

- Prospective clinical data collection involves collecting data specifically for quality measurement purposes; it is more specific and can define exactly what data is required. It is however not readily available and expensive to collect.
- Survey data involves collecting data regarding knowledge, attitudes and behaviours and is not otherwise available. It is not readily available and is expensive to collect.

3.2.5. Identify data for development

The project team should identify a core set of data for collection based on data requirements and feasibility of collection.

Modelling can assist in the process of identifying the required data. The modelling process can utilise diagrams to represent the various object classes and their relationships (See Figure 5). An object class is the subject of interest such as a patient, service or facility. Clear definitions of object classes ensure that there is a shared understanding of each object class and provides for consistent reporting.

Each object class has a relationship with other object classes and there are many types of relationships. Examples of types of relationships are one to one, one to many, many to one, optional and mandatory. Each object class can then be described using characteristics called data elements. Examples of data elements used to describe a patient are name, sex, date of birth, and Unique Health Identifier. The data element used to represent an entity should be agreed upon and standardised using metadata.

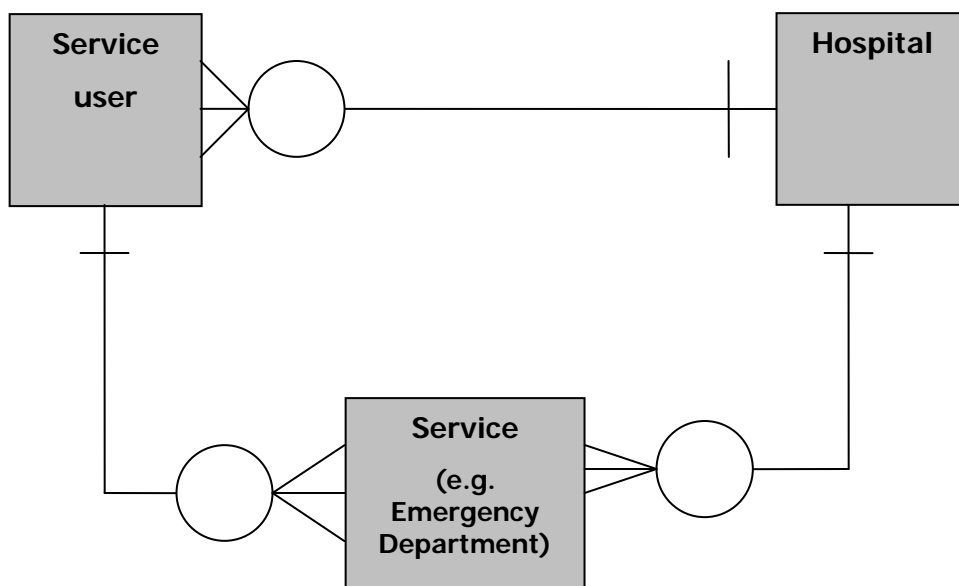


Figure 5: Data modelling (identifying object classes and relationships)

3.2.6. Develop data elements

To ensure consistency in data collection and use, and, to ensure accurate interpretation of the data, it is necessary to define the characteristics or attributes of each data element of the MDS through metadata.

Each data element should have specifications to outline the meaning and the representation of the data, so that it is collected in a consistent manner and permits comparisons. The meaning of a data element is expressed as a concept and the representation of the data element is expressed as a value domain ⁽⁵⁵⁾.

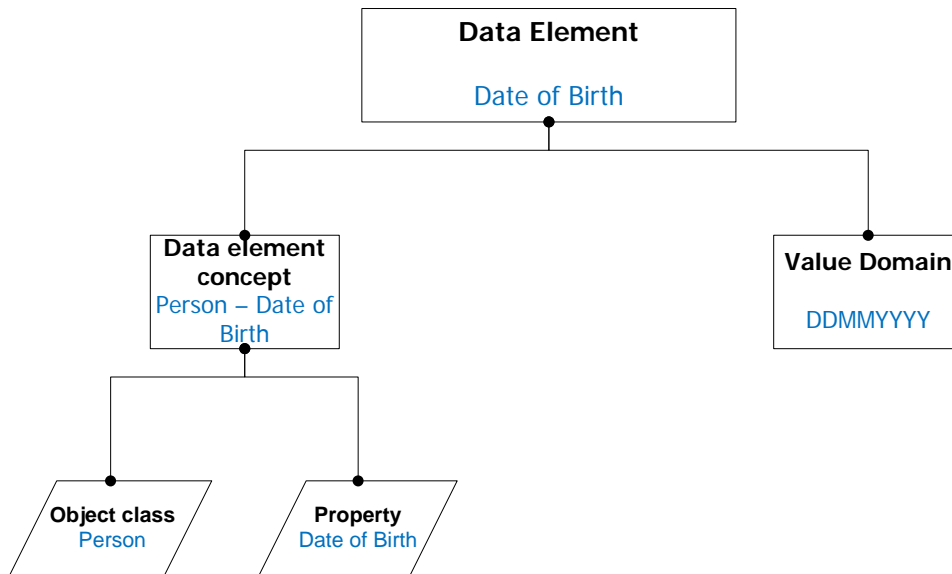


Figure 6: Metadata

The union of an object class and a property results in a data element concept and, the representation of a data element concept by a value domain results in a data element (see Figure 6).

A value domain specifies how something should be represented, such as date of birth can be represented using 8 digits (DDMMYYYY).

High quality data collection processes in which the data set is well defined and standardised (see Table 2) ensures that the same data is not collected, counted or reported differently for different purposes⁽⁴¹⁾. This results in a reduction in the burden and use of resources for data collection and facilitates the principle of “create once, use often”.

Data collection should not be reliant on or limited by the capability of one particular system, organisation or data collection tool.

Table 2: Example of data element attributes

Data Set Name	Waiting times – Emergency Department
Data element name	Time patient presents
Synonyms	Presentation time
Metadata item type	Data element
Technical name	Health Service event – Presentation time
Registration status	Is this a National Data Standard item
Definition	The time at which the patient presents for the delivery of a service
Data element concept	Health service event – presentation time
Value domain	hhmm
Field length - Maximum	4
Field length - Minimum	4
Instructions	The time of patient presentation at the <i>Emergency Department</i> is the earliest occasion of being registered clerically or triaged
Reference source	ISO 8601:2000: data elements and interchange formats – Information interchange – Representation of dates and times

3.2.7. Comply with Information Governance

Healthcare information is sensitive and therefore there must be provision made for the security and confidentiality of data held on patients. The dataset and reports should comply with data protection regulations and should have respect for privacy and confidentiality issues. Certain data to certain audiences, that are considered private and confidential, may not be made available for measurement purposes and result in incomplete data, leading to unreliable or inaccurate information. It is therefore necessary to ensure that the data required to support the KPI will be accessible.

3.2.8. Plan quality checks

There should be routine quality checks to minimise the occurrence of reporting and input errors.

Quality checks can be introduced at all stages of the measurement process, such as data collection, processing, analysis, use and dissemination. Quality checks can include visually scanning the data to verify that it falls within anticipated ranges, performing data quality audits, incorporating automatic quality checks in to the collection process and routinely verifying completeness of data. It is also important to provide data quality reports to users and to include any identified recommendations based on the quality reports.

3.3. *Data reporting to stakeholders*

There should be a plan to outline how and when the results of the measurement process are released to stakeholders and the public.

The frequency of publication of results should ensure that information is made available in a timely manner and continues to be relevant to the information needs of the stakeholders and service users.

The results should be presented to allow the intended audience easily interpret and use the information generated by the measure⁽³⁸⁾. Priority should be given to ensuring interpretation by multiple audiences rather than an individual audience. For example clinicians will have a better understanding of information presented with clinical detail, whereas service users may prefer information at a more summary level. The purpose of

data reporting is to inform, so that improvements can be made based on the available information.

3.3.1. Determine frequency of processing and analysis

Determine the frequency for processing and analysing the data collected.

It may not always be necessary to process and analyse data at the same frequency as data collection. It may be practical to collect data on a daily basis, but for analysis and comparison purposes it may be appropriate that this data is processed and analysed on a weekly, monthly or even annual basis.

3.3.2. Define method of analysis

A detailed protocol should be developed for scoring and analysis. This should address issues such as missing data, risk adjustment, and also what is acceptable performance.

In order to determine the significance of the results of the measure it is necessary to develop a protocol for scoring. In some cases scoring can be presented as the proportion of the total population that have experienced the particular aspect of the service being measured. Other scores can be based on the proportion that has achieved a particular standard or threshold.

3.3.3. Define type of measure

The chosen method for analysing and presenting the results should be determined and this is based on the topic/service being measured.

The following is an example of various ways of presenting the results of the measurement process⁽³⁹⁾.

- *Rate-based indicators:* use information about events that are expected to happen frequently. The measurements can be represented as proportions or ratios.
 - *Proportion indicators:* to allow comparisons between organisations or trends over a specified time they require both a numerator and a denominator. The indicator must identify the population at risk of the event and the period of time within which the event might take place. They are usually expressed as a percentage and the numerator is contained in the denominator. An example of proportion indicators is the proportion of cardiovascular related deaths that are male.
 - *Ratio indicators:* the numerator is not contained in the denominator e.g. ratio of male to female cardiovascular related deaths.
- *Count indicators:* measure the number of events without a denominator. An example of a count indicator is the number of newly detected cases of tuberculosis in a given year.
- *Sentinel indicators:* identify individual events that are intrinsically undesirable and always trigger further analysis and investigation. Sentinel events represent the extreme of poor performance. An example of a sentinel indicator is the number of maternal deaths during the perinatal period.

3.3.4. Determine level of aggregation

Determine what level of aggregation over space and time is needed for analysis purposes.

Aggregation over space refers to the geographical region by which data will be reported, which could be nationally or within a specific health delivery region. Aggregation over time refers to the time period for which the information will be reported, which could be daily, weekly, monthly or annually. These factors may be determined by the level within the organisation to which data is reported.

3.3.5. Develop risk-adjustment strategy

There should be a risk adjustment strategy to reduce the possibility of external factors influencing the measure and to ensure that the measure is a true reflection of the process being measured.

There should always be consideration given to determine if a risk-adjustment strategy is necessary. Certain characteristics related to the patient or disease may influence the outcome, including age profile of the patient population, co-morbidities, socio-economic features and patient compliance. These prognostic factors should be identified and factored in to the measurement specifications through case-mix adjustment models by clinical epidemiologists to facilitate comparability. This may involve collecting additional data to assist in the analysis.

Alternatively, restricting the measurement to a specific patient population will ensure that patient characteristics do not have an undue influence on the comparison process.

3.4. Pilot test the indicators

Even though a considerable amount of time and effort may have been spent designing the specifications, it is necessary to test the indicator as there may be a need for refinement. This can generally be done through a small pilot and can assist in identifying issues such as gaps in data collection processes.

Prior to commencing the pilot test the project team should have a clear plan for the pilot. Issues covered in the plan should include the criteria for selecting the pilot site(s), proposed length of pilot test, training and education of participants and information to be obtained from the pilot. The information to be obtained from the pilot can be posed as a number of questions, such as⁽⁵⁶⁾:

- Are there reliability issues in relation to data collection?
- Is the information obtained from the indicator of use in decision-making?
- Can the indicators contribute to improved service and quality of care?
- Have there been any issues identified through quality checks and are data recorded consistently?
- What additional measures that were not in place for the pilot, need to be instituted for the indicators to be rolled-out successfully?
- Are there any modifications necessary to the indicator specifications?

The pilot test can also be used to validate the indicators against the selection criteria used for developing the indicators (Figure 4).

Once the pilot test has been completed to the satisfaction of the project team, it will be necessary to develop a plan for the roll-out of the indicator project to the identified sites.

3.5. Determine review frequency

There should be a plan to review the indicator at regular intervals with a view to refinement in response to stakeholder demands or improved data availability.

Health services are in constant flux and it is important that performance indicators respond to these changes. There should be a date set for reviewing the indicator to ensure that it is still relevant and up to date. The review may highlight the need to modify the indicator or aspects of the indicator in response to stakeholder demands, improved data availability and changes in clinical practice. Changes may involve modifying the target, threshold or definition based on new evidence or alterations in the health system. However, for the purpose of comparability and monitoring long-term trends, indicators should not be amended too frequently⁽³⁵⁾.

Chapter 4: Emergency Department Performance Indicators

4.1. Introduction

This chapter details a review of performance indicators used in other jurisdictions to determine what indicators are in use internationally to monitor the performance of EDs. This review will inform the process of identifying KPIs suitable for monitoring the performance of EDs in Ireland to be used in the impact assessment. The countries reviewed were chosen primarily on the basis of information available in the English language, but also on population size comparable to Ireland. The chapter also includes a review of KPIs in Ireland and an overview of data collection relevant to EDs

4.2. England

In England, the Care Quality Commission (CQC), formerly the Healthcare Commission, is responsible for assessing and reporting on the performance of healthcare organisations in the National Health Service (NHS) and in the private sector. The CQC have a statutory responsibility to report on the performance of all NHS organisations annually and this has been done since 2005 through their Annual Health Check. The Annual Health Check assesses the quality of services and also the quality of financial management. Evaluation of the quality of services involves assessing organisations against a set of core standards established by the Department of Health and also an assessment based on performance indicators⁽⁵⁷⁾. The performance indicators are chosen in consultation with clinicians and service providers for individual service areas.

Performance indicators monitoring the performance of emergency departments include measuring the wait time from registration of patients to when they are seen by a clinician, percentage of patients dealt with within 4 hours, percentage of people who

return within 7 days, inpatients views of their experience in the ED and compliance with the national target for thrombolysis⁽⁵⁸⁾.

The indicator measuring the wait time to be seen by a clinician accounts for the fact that not all patients need to be seen by a doctor; as many patients, particularly in minor injury units can be assessed and treated by a nurse. The indicator description states that care has commenced once that patient has been seen by a clinician that can treat, discharge or transfer the patient. The NHS has set a target that 98% of patients should be seen and discharged or admitted from the ED within 4 hours of presentation at the department. This measurement evaluates the total time a patient spends in the ED regardless of disposition after evaluation and treatment.

Effectiveness of the emergency department is measured by the number of patients that return to the ED within 7 days, excluding planned re-attendance. Patient's perspective on whether the service meets their needs is obtained via a questionnaire given only to patients that have been admitted through the ED. The questionnaire seeks to determine patients' views about the information provided to them about their condition or treatment and whether they were afforded sufficient privacy during examination or treatment. The clinical aspect of the ED is evaluated by measuring compliance with guidelines that recommend thrombolysis for eligible patients with evolving myocardial infarction within 60 minutes of calling for professional help. The national target is 68%, but a 10% improvement on the previous year for organisations that have not achieved the national target is acceptable.

4.3. Denmark

The Danish National Indicator Project (NIP) measures the quality of care provided by the hospitals to groups of patients with specific medical conditions. The aim is to create awareness in patients, families, doctors, nurses and other healthcare professionals about the extent to which the completion and outcomes of the treatment are up to the standards which are expected from a well-functioning healthcare service. The quality of care is measured for eight conditions:

- Acute surgery (bleeding gastro-duodenal ulcer and perforated peptic ulcer)
- Chronic Obstructive Pulmonary Disease (COPD)
- Diabetes
- Heart failure
- Hip fracture
- Lung cancer
- Schizophrenia
- Stroke

Six to ten indicators have been developed for each condition by multidisciplinary committees, consisting of healthcare professionals relevant to the care of each condition such as physicians, nurses, physiotherapists, dieticians, etc.⁽⁴⁹⁾. Participation by hospitals is mandatory. Each hospital receives their own results monthly to facilitate continuous quality improvement and national results are published annually in the interest of transparency, accountability and freedom of choice for the public. Even though the project will be expanded in 2009 to include birth, depression and inflammatory bowel disease, there was no evidence to demonstrate that the indicators incorporated the emergency department aspect of care for these conditions.

4.4. New Zealand

Quality Health New Zealand (QHNZ) is a designated auditing agency of the New Zealand Ministry of Health. The organisation undertakes performance measurement through audits of the health and disability services against specific sector standards, as part of an accreditation process or through a clinical indicator service⁽⁵⁹⁾. It works in partnership with the Australian Council on Healthcare Standards (ACHS) on developing accreditation standards and clinical indicators. They have developed a suite of indicators to monitor the performance of healthcare organisations across New Zealand and Australia and publish the results in a comparative report that allows benchmarking against the previous nine years' results or against other organisations. The indicator suite for emergency departments consists of wait times to see a clinician based on triage category, time to thrombolysis and time to Percutaneous Transluminal Coronary Angioplasty (PTCA) for acute myocardial infarction, and time from registration to discharge, admission or transfer from the ED.

Within New Zealand, there are 21 District Health Boards (DHBs) that are responsible for the provision of health and disability services within their district. The New Zealand Ministry of Health requires all DHBs to provide information on hospital performance every three months, which is then used to compile a quarterly Hospital Information Benchmark report.

Performance indicators used to evaluate ED performance are the triage based wait times developed by QHNZ/ACHS. The triage system used is the Australasian Triage Scale (ATS), which has 5 categories, but only category one, two and three are reported. The triage scale rates the urgency with which a patient requires care and treatment based

on an assessment of their condition, escalating in urgency from Category 5 patients who require less urgent attention through to Category 1 patients requiring immediate attention. The targets for this indicator are 100% of ATS 1 patients should be seen immediately, 80% of ATS 2 patients should be seen within 10 minutes and 75% of ATS 3 patients should be seen within 30 minutes.

4.5. Canada

The Canadian Institute for Health Information (CIHI) is an independent not-for-profit organisation that gathers, analyses and publishes information on the Canadian health service. CIHI is responsible for maintaining a large number of databases and registries that capture information across the spectrum of healthcare. These include the Canadian Joint Replacement Registry (CJRR), Continuing Care Reporting Registry (CCRR), Hospital Morbidity Database (HMDB), Hospital Mental Health Database (MHMD) and the National Ambulatory Care Reporting System (NACRS), among others. This information is then available for the purpose of monitoring the performance of the healthcare system to hospitals, health authorities and government agencies⁽⁶⁰⁾. CIHI continually monitor for gaps in information to determine additional data collection opportunities that can contribute to performance improvement.

The NACRS contains information on all hospital and community ambulatory care, including day surgery, outpatients and emergency departments. Performance indicators used to monitor the performance of emergency departments are based on wait times and include:

- Length of Stay (LOS): The elapsed time, in hours, from the earlier of Triage Time or Registration Time to the time the patients left ED or Disposition Time.

Disposition time refers to when the ED element of assessment or treatment has been completed and the patient is ready for discharge, transfer or admission.

- Wait Time to Physician Initial Assessment (WTPIA): The elapsed time from the earlier of triage or registration to the Time Physician Initial assessment.
- Wait Time to Inpatient Bed hours (WTIB): The elapsed time from Disposition Time to the Time Patient Left ED.
- Time to Disposition (TtoD): The elapsed time, in minutes, from the earlier of Triage Time or Registration Time to ED Disposition Time.

There are no clinical performance indicators for EDs, however as of 2009/2010, CIHI will start collecting additional data elements that will permit the calculation of additional indicators.

Provinces within Canada also report wait times against targets that have been developed regionally. For example, Ontario reports total time spent in ED from registration or triage to discharge, transfer or admission to a hospital bed. There are two targets for wait time in ED. The first target states that 9 out of 10 patients with complex conditions that require more time for diagnosis, treatment or admission should spend no longer than 8 hours in the emergency department. The second target states that 9 out of 10 patients with uncomplicated conditions that require less time for diagnosis, treatment or observation should spend no longer than 4 hours in the emergency department.

4.6. Australia

The Australian Institute of Health and Welfare (AIHW) are a statutory body accountable to the Australian parliament and are responsible for information and statistics on health, community services and housing assistance⁽⁶¹⁾. AIHW are required to report to

parliament every two years on the health of the nation; the most recent report was published in 2008⁽⁶²⁾. In 2008 the AIHW updated the suite of 40 indicators on which the report is based⁽⁶³⁾, and included in the remit for the update was the aim of selecting indicators that were suitable for public reporting on the performance of the healthcare system. Sixty percent of the final set of indicators are already being reported either nationally or in some jurisdictions within Australia. The indicators are grouped into the dimensions of care of Better Health, Focus on Prevention, Access, High Quality – Appropriate, High Quality – Safe, Integration and Continuity of Care, Patient Centred, Value for Money and Sustainable. Performance indicators used to assess the performance of EDs are based on wait times according to triage categories. The targets for this indicator are 100% of ATS 1 patients should be seen immediately, 80% of ATS 2 patients should be seen within 10 minutes, 75% of ATS 3 patients should be seen within 30 minutes, 70% of ATS 4 patients should be seen within 60 minutes and 75% of ATS 4 patients should be seen within 120 minutes. Interestingly, thrombolysis time for patients presenting with acute myocardial infarction was considered for selection, but was not included in the final set of indicators. This indicator is included in the ACHS suite of indicators outlined in the New Zealand section of this chapter and reported annually for participating Australian organisations.

4.7. Netherlands

The Netherlands Healthcare Inspectorate (IGZ) is an independent organisation that reports to the Minister for Health, Welfare and Sport. It is responsible for supervising the management of the healthcare system and for reporting on performance. Each year since 2003, it distributes a suite of performance indicators “Basic set of Hospital

Performance Indicators” to all hospitals in the country and it is mandatory to return the requested data. The indicators were developed in conjunction with the Dutch Association of Hospitals (NVZ), the Dutch Federation of Academic Hospitals (NFU) and the Order of Medical Scientists. There are a broad range of indicators covering topic areas such as blood transfusions, postoperative pain, healthcare ICT, quality assurance and financial position. The author was unable to identify any indicators specifically measuring emergency department performance. The results of the indicators are published annually.

The “Dutch Healthcare Performance Report” is compiled by the National Institute of Public Health and the Environment (RIVM) on behalf of the Ministry of Health, Welfare and Sport and describes the performance outcomes of Dutch healthcare⁽⁶⁴⁾. The report is based on a framework of indicators that have been developed in collaboration by researchers from the OECD, Dutch universities and other knowledge centres. The indicators are grouped under the themes quality of healthcare, access to healthcare and costs of healthcare. These three themes are then subdivided into twelve indicator domains. Quality is divided into Effectiveness, Safety, Innovation; Accessibility is divided into Financial barriers, Geographical barriers, Timeliness, Social barriers, Availability of care and personnel, Freedom of choice; and Costs are divided into Health care expenditure, Financial position of care providers and health insurers, and labour productivity.

Indicators relevant to the provision of emergency care appear in the report under “Timeliness of acute care” under the accessibility theme and are based on access to

acute care either by distance or time. The indicators include the number of ambulance rides that exceed the 15-minute norm, the number of people that can be reached by a mobile medical team within 30 minutes, the number of people that can reach the nearest emergency medical services by car within 30 minutes and the number of people who place an emergency call to the general practice cooperative and are helped by a professional within 1 minute of placing the call. Again there did not appear to be any measures specific to emergency departments.

4.8. Ireland

The Health Information and Quality Authority (Authority) was established in Ireland under the Health Act 2007⁽⁶⁵⁾ to drive continuous improvement in health and social care services. Prior to the establishment of the Authority the responsibility of quality assuring the health services rested with the Irish Health Services Accreditation Board (IHSAB). The IHSAB promoted quality improvement through the process of accreditation, which was voluntary and limited to acute care hospitals. The accreditation model used in Ireland was based predominantly on a combination of the New Zealand and Canadian models. The IHSAB was established in 2001 and has now been replaced by the Authority.

The Authority has already published a number of standards including, National Standards for the Prevention and Control of Healthcare Associated Infections⁽⁶⁶⁾, Standards for Residential Care Settings for older people⁽⁶⁷⁾, Standards for Residential Services for People with Disabilities⁽⁶⁸⁾, and are in the process of developing standards for the purpose of regulating healthcare in Ireland. The Authority is currently in the process of coordinating the development of performance indicators for EDs.

4.9. Health Service Executive

The Health Service Executive (HSE) is responsible for providing health and social care services in the Republic of Ireland⁽⁶⁹⁾. The HSE is divided into three service delivery units for operational purposes and these are Population Health, Primary, Community and Continuing Care (PCCC), and the National Hospitals Office (NHO). Population Health is responsible for health promotion and prevention activities including immunisation programmes, infection control and environmental health. PCCC is responsible for the delivery of all primary, community and continuing care health and social services within the community, excluding acute hospital services. The NHO are responsible for managing acute hospital services in all of the 50 acute hospitals in Ireland, including pre-hospital emergency care services. Of the 50 acute hospitals, 34 have an emergency department, though not all are open on a 24-hour basis and some do not open on weekends.

4.10. Performance Management Unit

The Performance Management Unit (PMU) is the central repository for information within the NHO. The PMU are responsible for collecting information regarding activity within the acute hospital sector, which is then distributed to relevant departments within the HSE, as appropriate, for performance monitoring purposes. Each hospital has a designated contact person responsible for ensuring data are returned to the PMU and for clarifying/investigating data quality issues on behalf of the PMU. The PMU have three main responsibilities:

1. Gather data
2. Produce reports

3. Performance management and service improvement

Depending on the information needs of the PMU, specific data is gathered daily, weekly, monthly and annually.

Census data (Appendix 5) is gathered daily and records the numbers of patients waiting for a hospital bed from the point of "decision to admit" in 34 hospitals with EDs.

Data gathered weekly includes the data necessary for Patient Experience Time (PET). PET measures the average time from registration to discharge from the ED for all patients in 27 of the 34 hospitals with EDs and is reported monthly on the HSE website (Appendix 6). The Weekly Activity Report (Appendix 7) gathers the data required to record the activity profile for each of 34 hospitals with EDs, which includes the number of people that attend ED recorded by 4 hour time periods (recorded daily but returned weekly). Also collected are return attendances (scheduled re-attendance) and emergency admissions other than those admitted through the ED such as from Out Patient Departments (OPD), Medical Assessment Units (MAU), ward walk-in, inter-hospital transfer, etc. Triage data are also captured by a number of facilities, but not all patients are triaged. This can be due to the absence of a triage nurse for periods in some facilities, while others do not have a triage nurse at any time. Most hospitals use the Manchester Triage System or a variation of it, but the PMU do not maintain records of the triage system used in each facility. Delayed discharges are recorded each Monday morning for each of the 34 hospitals with EDs and some additional hospitals that do not have EDs, such as Bantry and Nenagh. This is high-level data and does not track patients.

Data gathered monthly includes inpatient, outpatient and day-case activity for reports on hospital activity such as discharges, day-cases and consultant/nurse delivered OPDs by speciality. Also gathered monthly are emergency presentations according to triage category, bed closures and reason for closure, source of admission, and referrals to and from the National Treatment Purchase Fund (NTPF).

Data gather annually includes the number of beds, treatment chairs, trolley bays, etc. in each facility.

4.11. Performance Measurement

The HSE National Service Plan (NSP) 2009 sets out the type and volume of health and personal social services they are planning to provide during 2009⁽⁷⁰⁾. A Joint Department of Health and Children (DoHC) and HSE Performance Information Group (JPIG) has been created to develop a framework for performance information with common datasets, and they are in the process of developing performance indicators at four levels within the health system:

- Population health common dataset: annual report on the health of the population
- Corporate Performance Measurement (CPM): biannual report on high level corporate objectives
- Performance Monitoring Report (PMR): monthly audit against the National Service Plan
- Healthstat: monthly operational report on key metrics

Of relevance to this project and emergency department monitoring are two reporting mechanisms, the Performance Monitoring Report and Healthstat.

4.11.1. Performance Monitoring Report (PMR):

The PMR is a monthly audit against the National Service Plan (NSP) which reports on the performance indicators outlined in NSP 2009. Examples of performance indicators identified in the NSP to be included in the monthly PMR include Average Length of Stay (ALOS), Bed Days Used, Occupancy Rates, Day Cases, Waiting Lists and Emergency Department Turnaround Times. The HSE have two methods of reporting ED turnaround times.

The first is census data and reports the numbers of patients waiting for a hospital bed from the point of "decision to admit" in the 34 hospitals with EDs. Patients are included in the census when "decision to admit" is made by the ED consultant. Routine information such as ED trolley counts are collected at 8am and at 2pm, but only the 2pm data are published daily on the HSE website (Appendix 8). The census only includes those patients waiting for admission that are physically present in the ED on chairs or trolleys at the time of the census and excludes patients waiting in inappropriate observation beds, day wards, admission lounges or patients referred for admission from OPD.

The second method is Patient Experience Time (PET) and reports the average time from registration to discharge from the ED for all patients in 27 of the 34 hospitals with EDs. The capacity to return the data necessary for PET was tested by the HSE in 2008 and only 10 hospitals had information systems capable of making returns of complete patient data. These hospitals return PET data on the Weekly Activity Report (Appendix 7). Returns from the other 17 hospitals are based on sample information for selected times

and then calculating an average for the reporting period. These hospitals log on to the PMU data warehouse via a web browser and input the data remotely. The list of 34 hospitals with EDs are listed in Appendix 9, which also indicates which hospitals contribute to PET data and whether actual patient data are used or sampling data. The HSE are in the process of upgrading hospital information systems and once this is complete, the sampling methodology will cease and complete patient information will be reported

4.11.2. Healthstat:

Healthstat is a monthly operational examination of key metrics in services. Information for Healthstat is obtained from existing information sources within the HSE such as the PMU, Casemix, National Treatment Purchase Fund, etc and where the data items have not previously been routinely collected, a 'Healthstat Monthly Hospital Template' is completed. The metrics are presented graphically via a dashboard and allow hospitals to monitor performance against national targets but also against other hospitals. The reports are made publicly available by hospital via the HSE website. There are three themes used for monitoring purposes, Access, Integration and Resources (AIR) and within each theme are a number of metrics:

- **Access:** Metrics are based on waiting times and include waiting times for various elective medical and surgical procedures, ED acute admission waiting times, GP referral wait times for outpatient diagnostics and physiotherapy, and consultant to hospital wait times for diagnostics.

- **Integration:** Metrics are based on the patient journey once in the system and include day case procedure rates, inpatient average length of stay, delayed discharges, and appropriateness of admission and care.
- **Resources:** Metrics are based on value for money, staff numbers and ratios, activity in relation to service plan and public/private split of activity.
-

The dashboard uses a traffic light system to visually represent the hospital's performance against targets. Green indicates that the hospital performance either meets or is within an acceptable range of the target. Amber indicates that the hospital performance does not meet the target and is outside an acceptable range of the target. Red indicates that hospital performance is significantly outside the range of acceptable performance and is of significant concern⁽⁷¹⁾.

Targets for the metrics are either Absolute Targets that have been predetermined, Relative Targets that are the average of the best three performing hospitals or Group Average markers representing the average performance of all the hospitals. Each month the CEO and Clinical Directors are invited to a meeting with the HSE Management Team to discuss performance and identify areas for improvement

Information published in Healthstat in relation to ED waiting times is based on trolley census counts returned to PMU. The example shown below (Figure 7) has been given a red traffic light because there are an unacceptable number of patients waiting for admission in excess of the 100% target for all patients to wait from zero to 6 hours.

Each theme, access, integration, and resources, is also given a traffic light rating based on the results of all the indicators within that theme and each hospital is given an overall rating based on the results for all of the themes (Appendix 10).

There are no structure, clinical or outcome indicators used as a measure of ED performance.

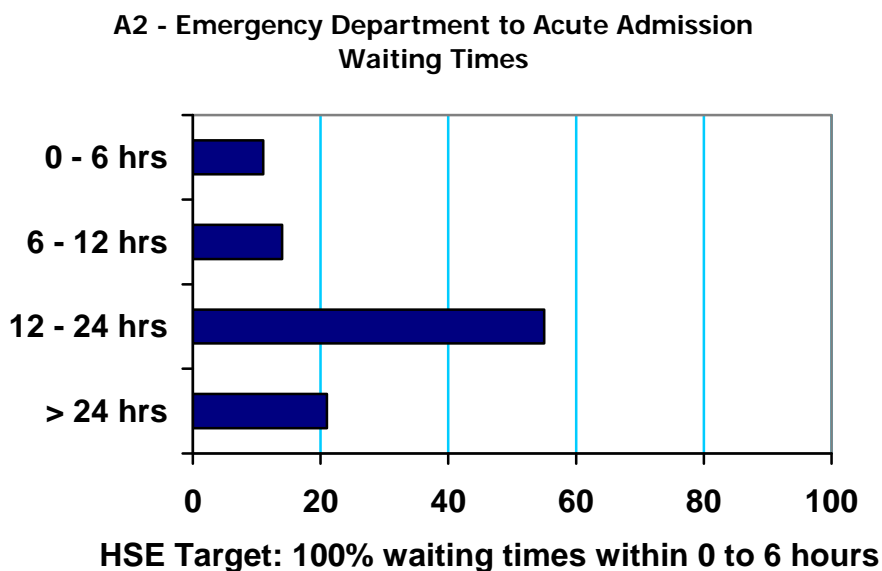


Figure 7: Healthstat

4.11.3. Hospital Information Systems:

A number of Hospital Information Systems (HIS) in use in Ireland have been predominantly developed for administration purposes rather than clinical. According to the Tribal Secta report⁽¹¹⁾ many Irish hospitals do not have adequate information systems to support patient management. Current systems do not have the capability to track the patient journey through the healthcare system and many do not have the capability to order and process tests or capture performance related data such as triage category or waiting times from triage to treatment. Information systems in a number of

EDs are inadequate to collect patient activity. This was clearly demonstrated when the HSE attempted to implement PET. In fact, only 10 out of the 34 hospitals can collect this type of data currently in Ireland. The HSE are currently reviewing and upgrading systems and testing the feasibility of introducing the PET in the remainder of hospitals. It may be due to outdated information systems that there appears to be a lack of culture for data collection within the healthcare system, whereby data collection is viewed as a separate rather than integrated process of care delivery.

Clinical/diagnostic data are being captured on different systems within hospitals, such as laboratory and x-ray. Within a hospital, the Medical Record Number (MRN) is used to track a patient once the patient is admitted, however different number systems can be used by various departments for patient identification purposes, such as in the laboratory and ED. In the absence of a Unique Health Identifier (UHI), the patient journey cannot be tracked within or between hospitals or between primary and secondary care.

Chapter 5: Impact Assessment

5.1. Introduction

The most scientific way to carry out an impact assessment of collecting the data required for a KPI is through pilot implementation and assessment. However, the resources and time necessary to do this are outside the scope of this project. It was therefore decided to interview key ED personnel with significant experience of working in EDs for the impact assessment. Details of the interview process are outlined later in this chapter. To provide context for the impact assessment an overview of EDs and the typical patient journey through ED from registration to discharge is also provided.

5.2. Emergency Departments

There are predominantly two models of emergency medicine practiced internationally, the Franco-German model and the Anglo-American model⁽⁷²⁾.

In the Franco-German model, clinicians visit the patient and provide emergency treatment in a pre-hospital environment. Patients are usually triaged prior to arrival at the hospital and can therefore be directly admitted to the appropriate speciality within the hospital. Physicians usually have a background in anaesthesia, and emergency medicine is not an independent speciality. This model is practiced in Austria, Belgium, France, Finland, Germany, Norway, Sweden, Russia, Latvia and Poland.

In the Anglo-American model, patients are brought to specialised emergency departments attached to hospitals and care is provided by clinicians trained specifically in the field of emergency medicine. Emergency medicine is recognised as an independent speciality with specific training programmes. This model is practiced in

countries such as United States, Australia, Canada, China, Israel, the Philippines, Japan, New Zealand, United Kingdom, China and Ireland.

5.3. ED process

EDs are at the interface of primary and secondary care and are often the first point of contact for patients requiring acute care services. There are a number of means by which patients can avail of the services of an ED.

- Patients can be self-referred, whereby they arrive at an ED without first seeking the attention of primary care services, such as that of a GP.
- Patients can be referred to an ED following review by a GP or a consultant in OPD, who determines that the patient requires further assessment or care of a nature or urgency that can only be provided in a secondary care facility.
- Patients can be taken to an ED by ambulance services following an acute event requiring the intervention of emergency services.

Following arrival at the ED there is a typical journey that the patient follows resulting in either admission, transfer or discharge from the ED (Figure 8). There can, however, be variations in the patient journey depending on the urgency and nature of the presenting condition and minor variations in individual ED processes.

5.3.1. Registration

The patient care episode commences when the patient presents at the ED or is registered by clerical or administration staff at the ED. This is usually done electronically but, in the absence of an IT system, it can also be done manually in a paper-based record. Once registered, walk-in patients are usually directed to the waiting room until they are called by the triage nurse for assessment. Following triage the patient may

return to the waiting room to await further assessment by a physician or Advanced Nurse Practitioner (ANP), unless the triage rating dictates that immediate attention is required.

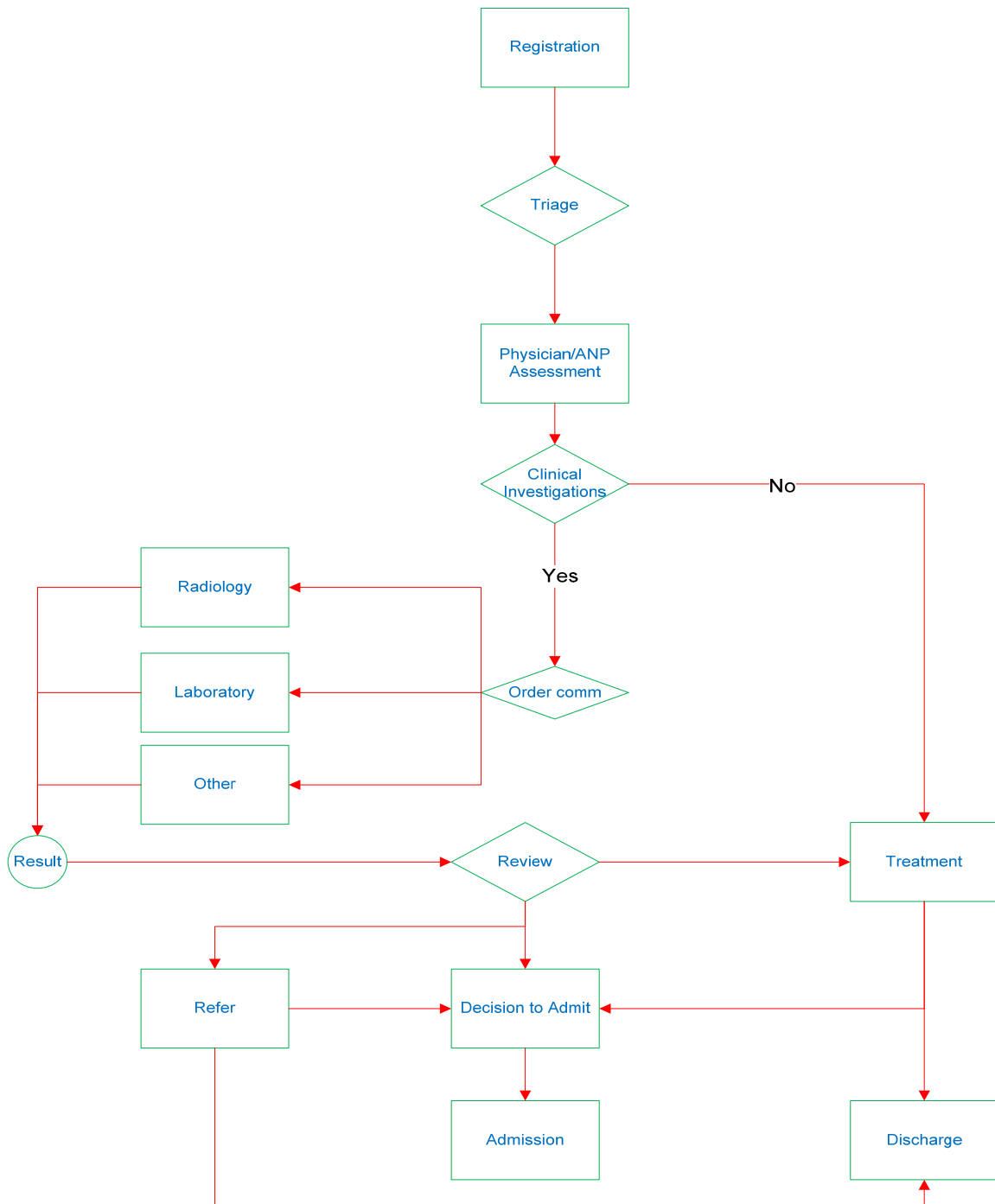


Figure 8: Typical patient journey through the ED

Patients that arrive by ambulance may be triaged prior to arrival based on information supplied by paramedics/Emergency Medical Technicians in transit and are usually directed immediately to the appropriate treatment area.

5.3.2. Triage

The term triage comes from the French word “trier”, which means “to sort” and was originally used in a medical context during the Napoleonic wars to determine treatment for casualties based on medical need rather than rank. In modern medicine, triage is used in emergency departments to ensure patients receive appropriate care, within the appropriate timeframe and in the appropriate place. Triage is usually performed by nurses with specific training to prioritise patients for medical attention according to the assessed urgency of their condition. Patients are assessed according to an algorithm based on presenting symptoms or condition in combination with measurements such as blood pressure, pulse, respiration and body temperature and are allocated a rating on a triage scale which can either be three-level, four-level or five-level. There are three methods of triage predominantly in use internationally and all are five-level triage scales.

The Australasian Triage Scale (ATS) is used throughout Australia, New Zealand and in other parts of the world, including the United States⁽⁷³⁾. It is a five-level scale from ATS 1 to ATS 5, indicating the maximum waiting time for patients in each scale and includes the performance indicator thresholds that hospitals should achieve for each level (Table 3).

Table 3: Australasian Triage Scale

ATS Category	Treatment Acuity (Maximum waiting time)	Performance Indicator Threshold
ATS 1	Immediate	100%
ATS 2	10 minutes	80%
ATS 3	30 minutes	75%
ATS 4	60 minutes	70%
ATS 5	120 minutes	70%

The Canadian Triage and Acuity Scale (CTAS) was originally introduced in 1999 and is a mandatory data element to be reported to the Canadian Institute of Health Information by all hospitals with emergency departments. It is a five-level scale from Level 1 to Level 5 (Table 4). It recognises that a triage rating is dynamic and that reassessment must take place at regular intervals to cater for changes in the patient's condition.

Table 4: Canadian Triage and Acuity Scale

Triage Level	Description	Physician/ANP assessment	Nurse reassessment
1	Resuscitation	Immediate	Continuous
2	Emergent	< 15 minutes	15 minutes
3	Urgent	< 30 minutes	30 minutes
4	Less Urgent	< 60 minutes	60 minutes
5	Non Urgent	< 120 minutes	120 minutes

The Manchester Triage System (MTS) is used throughout the United Kingdom. It is also a five-level scale and uses a series of flow charts based on presenting signs and symptoms rather than a diagnosis, to determine the appropriate triage category for the

patient. It uses a colour-coded system to identify patients according to triage category (Table 5).

Table 5: Manchester Triage System

Triage Level	Description	Target time (Minutes)
1	Immediate	0
2	Very Urgent	10
3	Urgent	60
4	Standard	120
5	Non-Urgent	240

EDs in Ireland predominantly use the MTS or a variation of it; however, the type of triage system used by each hospital is not consistent, therefore comparability between EDs is difficult.

5.3.3. Assessment by physician/ANP

Once a suitable treatment area is available, the patient is assessed by a physician or an ANP. The patient then either receives treatment based on the assessment or may require further clinical investigations such as laboratory tests, radiology, ECG, etc. These investigations are then ordered and the physician will wait for the results before reviewing the patient unless the patient's condition warrants immediate intervention.

5.3.4. Clinical Investigations

Clinical investigations may be ordered manually or electronically depending on the capability and availability of the information system in use at the hospital. Some investigations such as laboratory tests and ECGs can be carried out in the ED by staff from within the department, while the patient will usually have to go to the radiology

department for x-ray, CT scan, or ultrasound or other similar investigations. Some radiology exams such as x-ray can be carried out using portable equipment if the patient is too unstable to go to the relevant department. Results of the various investigations can be reported electronically, again depending on the capability and availability of the information system, or they can be reported verbally by phone or by paper record. Preliminary readings of x-rays can be carried out by ED physicians in the absence of a radiologist, such as at nights and weekends, and the x-rays are then sent back to the radiology department for review by a radiologist.

5.3.5. Review

Once the physician/ANP has all the necessary information obtained through assessment and investigation results, a decision will then be made to either discharge the patient, provide minor treatment and then discharge the patient, discharge with follow-up either by a GP or follow-up clinic, initiate treatment prior to admission, refer the patient for review by a specialist service or admit the patient.

5.3.6. Refer

When a decision is made to refer a patient to a speciality service, the on-call physician from that service is usually contacted by phone. The physician visits the ED to assess the patient and advise on further management, which may include additional investigations, treatment, admission or discharge. The speciality service may assume responsibility for that patient's care at this point, depending on the outcome of the assessment.

5.3.7. Treatment

Depending on the patient's condition and the result of the assessment, the patient will usually receive some form of treatment in the ED. Treatments carried out in the ED can vary considerably from wound dressings and suturing for minor injuries to defibrillation for cardiac arrest. Once treatment has been completed, the patient will then be discharged, admitted or transferred to another facility.

5.3.8. Admission/Discharge

The decision to admit or discharge will be made by the ED physician or by the physician from the speciality service to which the patient was referred. Once the decision has been made to admit the patient, a request will be submitted to bed management or nursing administration for an appropriate bed. The patient usually remains in the ED until a bed is available in a ward.

5.4. Outline of impact assessment

The purpose of the impact assessment is to determine the impact on processes and IT systems of collecting the data necessary for the following KPIs:

1. Emergency Department waiting times, to be measured from when the patient is first registered to either discharge, transfer or admission to a hospital bed
2. "Door to needle time" which measures the time from arrival to the administration of thrombolysis for patients with acute myocardial infarction

New attendances in Irish EDs range from over 11,500 to 75,000 per annum⁽⁷⁴⁾. The Irish Association of Emergency Medicine's categorisation of a medium sized ED is one that

has between 20,000 and 40,000 new attendances per annum, and this range accounts for in excess of 55% of Irish EDs. A medium sized emergency department has been chosen for this study as it represents the “middle ground” of the range of EDs operating in the Irish health service.

The impact assessment involved carrying out semi-structured interviews with five members of staff, each of whom are central to the operation of the ED and have significant knowledge and experience of emergency departments. The purpose of the interviews was to determine:

- Are the data as outlined in the KPI combined minimum data set currently being captured by the hospital information system (Table 6)?
- What impact, if any, will the collection of information as outlined in the KPI minimum data sets have on IT systems and processes?
- Is there a need to collect additional local data to support the introduction of national targets?

In order to protect the anonymity of the participants, their specific roles within the ED are not detailed in this dissertation, but the participants are representative of medical, nursing and administrative staff. To further protect the identities of the participants, any details that may identify the participating hospital have been omitted.

Ethical approval for the study was sought from the Research Ethics Committee at the School of Computer Science and Statistics in Trinity College Dublin and was subsequently granted following clarifications, amendments and the submission of

additional documentation as requested by the ethics committee. One of the comments from the ethics committee following the initial application for ethics approval was that the information sheet to be given to participants was too long. In response to this comment, the minimum data set for both KPIs were combined (Table 6) so that data elements common to both data sets were listed once and this was included with the information sheet.

Prior to meeting with participants, approval was sought and granted from hospital administration to participate in the study and permission was also granted to make contact with the identified participants. A letter was then sent to each of the participants (Appendix 11) requesting to meet with them and an information sheet outlining the details of the proposed study was included with each of the letters (Appendix 12). Participants were advised that they would receive a follow-up phonecall to determine if they would agree to participate and arrange a meeting at a time and date of their choosing. Prior to each of the interviews, participants were given a brief overview of the study and they signed a letter of consent agreeing to participate in the study (Appendix 13).

Table 6: ED waiting times/thrombolysis combined MDS

Data Elements	Definition
Medical Record Number	This is used to identify a patient uniquely within a healthcare facility
<i>Patient First Name</i>	The forename or given name of a person
<i>Patient Surname</i>	That part of a person's name which is used to describe family, clan, tribal group or marital association
<i>Date of Birth</i>	Date of birth identifies the day, month and year when the patient was born
<i>Sex</i>	A person's current gender
<i>Arrival date and time</i>	The date and time the patient is first registered or triaged, whichever comes first, by a clerical officer, nurse or doctor in the Emergency Department
<i>Date and time of discharge from ED</i>	The date and time at which a patient physically departs an emergency department after a stay
<i>Emergency Department discharge status</i>	The status or destination of the patient on departure from the Emergency Department: 1. Home 2. Ward 3. ICU/CCU 4. Admission lounge 5. Medical Assessment Unit 6. Transfer 7. Left without being seen 8. Died
<i>Diagnosis: Acute Myocardial Infarction</i>	This is the working diagnosis at the time of treatment in the Emergency Department
<i>Reperfusion type</i>	Identifies the type of reperfusion attempted 1. Thrombolysis 2. Primary PCI 3. Reperfusion not attempted 4. Unknown/Other
<i>Reason reperfusion not attempted</i>	Identifies the reason reperfusion is not attempted for acute myocardial infarction 1. Ineligible ECG 2. Too late 3. Risk of haemorrhage 4. Uncontrolled hypertension 5. Patient refused 6. Other
<i>Thrombolytic therapy start date and time</i>	The date and time of commencing thrombolysis by bolus or infusion
<i>Thrombolytic therapy delay reason</i>	Justified delay for commencing thrombolysis 1. Sustained hypertension 2. Delay obtaining consent 3. Cardiac arrest 4. Initial ECG not diagnostic 5. Other
<i>Thrombolytic drug</i>	The thrombolytic drug administered 1. Streptokinase 2. Tenecteplase 3. Reteplase 4. Alteplase

5.5. Interviews

There is no such thing as a worthless conversation, provided you know what to listen for. And questions are the breath of life for a conversation.

James Nathan Miller, 1965⁽⁷⁵⁾

The decision to use semi-structured interviews for the impact assessment was based on the premise that experienced staff working in the ED would be able to provide invaluable insight into the impact of collecting the data necessary for the chosen KPIs. Semi-structured interviews are useful for small-scale research projects, as they allow flexibility in the interview process and permit the interviewer to ask probing questions based on the interviewees answers. Interviews conducted for the purpose of qualitative research allow for exploration of areas that were not initially anticipated when the research began⁽⁷⁶⁾.

5.6. Interview Methodology

In order to ensure a degree of consistency in each of the interviews, an agenda of topic areas to be covered during each interview was prepared, called an *aide memoire*⁽⁷⁷⁾. An *aide memoire* does not contain a list of questions to be answered in a specific order and should allow flexibility to incorporate ideas from the interviewee that may emerge during the interview⁽⁷⁸⁾. A pilot interview was conducted with a colleague who had experience of working in EDs to determine if the proposed interview format would elicit the desired information. The interview format was amended to take into consideration the feedback from the pilot interview. Even though audio recording ensures that all of the information exchanged during the interview is captured, the author believed that some of the interviewees would not be comfortable with the prospect of having the conversation recorded.

Interviews were conducted on a one-to-one basis with five members of staff, over a period of four weeks. The interviews lasted between 25 minutes for the shortest, to 70 minutes for the longest. Brief notes were taken during the interview and more detailed notes were then written up based on the notes taken during the interview and the author's memory, prompted by the notes. The detailed notes were always written up shortly after the interview took place, to ensure a high degree of accuracy. Analysis of the interview notes identified two main themes, namely, data capture issues and delays in the patient journey through the ED.

5.6.1. Data capture

The Patient Administration System (PAS) in the study hospital has a core module for managing patients, doctors, etc. and has a number of sub-modules for use in specific departments, such as the ED, radiology, physiotherapy, OPD and day ward. When a new patient attends the ED, they are registered in the PAS and are assigned a number for identification purposes. In order to maintain the anonymity of staff from the participating hospital, the identifier will be called a Hospital Information System number (HIS number) for the purpose of this dissertation. This is a sequential number, assigned automatically to new patients by the PAS when they are first registered on the PAS in the hospital, and is the primary identifier for that patient for all future contact with the hospital.

Patients are assigned an MRN only when they are issued with a physical chart, and charts are typically issued only when a patient is admitted as an inpatient, a day-case or attends OPD. The MRN numbers are pre-printed on new charts and are manually assigned to the patient in the PAS, when used.

Each time a patient attends the ED they are assigned an ED Number, which is issued by the ED sub-module, and is a secondary identifier for ED use only. This is also a sequential number, issued according to the order in which patients present to the ED, but each time a patient visits the ED for a new episode of care, they will be issued with a new ED number. The ED number is used primarily for filing purposes in the ED.

The primary number used to identify patients in the Laboratory Information System (LIS) is the MRN, but patients who do not have a MRN are identified by the HIS number. Previously the ED number had been used as the identifier in the LIS for ED patients, but because patients were issued with a new number for each episode of care, this involved creating a new patient record in the LIS each time a patient visited the ED. A new ED number is issued even if that patient had laboratory investigations carried out on previous visits to the ED. The HIS number is now the primary identifier used in the LIS for ED patients, with a letter prefix to differentiate it from the MRN.

The Radiology Information System (RIS) uses the HIS number as the primary identifier for all patients and uses the MRN as a secondary identifier, where applicable. Records can be retrieved from the RIS by searching with either the MRN or HIS number.

Patient's clinical information is recorded manually in a treatment kardex and includes information such as clinical history, clinical assessment, investigations and results, drug prescriptions and treatment notes. An additional record may be kept by nursing staff, called a nursing kardex, for patients that spend extended periods in the ED or for

patients that require significant nursing interventions. The nursing kardex contains nursing assessment and treatment information.

A list of data elements from the MDS and their descriptions can be found in Table 6 (above) and a summary of how they are captured is detailed in Table 7 (below).

The first data element in the MDS is the MRN and was included in the MDS as it was assumed to be the primary identifier for all patients within the hospital. As HIS numbers are issued to all patients by the PAS and are intended to be the unique identifier by the hospital, it is appropriate that it should replace the MRN in the MDS. The MRN is unsuitable, as it is only issued to selected patients as outlined above and even if they have previously been issued with an MRN, it is not used as the primary identifier within ED. The ED number is unsuitable, as patients are issued with a new ED number for each episode of care.

Other data elements from the MDS (Table 6) recorded electronically are the patient's first name, surname, date of birth, gender, and arrival date and time. Discharge status, which details where the patient went following discharge from the ED, and discharge date and time are intended to be captured manually, both in the physician/ANP notes and in the nurses' notes. These will then be entered in the PAS by clerical staff once the patient has left the ED; however, both physicians and nurses do not always record this information, resulting in an estimated time of discharge rather than an actual time.

All diagnoses, including Acute Myocardial Infarction, are routinely recorded manually on the patient's treatment record, which is then entered electronically in the PAS by clerical

staff. The accuracy of the electronic record, however, is dependent on the interpretation of the clinical notes by the clerical staff, as the terminology used for the written diagnosis may not correspond exactly with the selection options from dropdown menu of the PAS.

The data elements "reperfusion type", "thrombolytic therapy start date and time", and "thrombolytic drug" will be recorded in the clinical notes, but will not be recorded electronically on the PAS. The remaining data elements from the MDS, "reason reperfusion was not attempted" and "thrombolytic therapy delay reason", are not usually recorded either electronically or manually, but this information could probably be interpreted from reading the patient's chart.

Summary of findings

1. The HIS number and not the MRN, is the primary identifier within the hospital and all patients that receive care or have investigations carried out by the hospital will be assigned a HIS number.
2. A MRN is only assigned to patients that have been admitted as an inpatient, day-case or attend OPD.
3. ED numbers are assigned to patients for each episode of care. Subsequently patients can have numerous ED numbers.
4. Data that are not captured electronically as part of the process of care are unlikely to be accurately recorded.

Table 7: Summary of data elements capture

Data Elements	Capture
Medical Record Number	Can be captured electronically but needs to be replaced by the HIS number in the MDS
Patient First Name	Usually captured electronically at time of registration
Patient Surname	Usually captured electronically at time of registration
Date of Birth	Usually captured electronically at time of registration
Sex	Usually captured electronically at time of registration
Arrival date and time	Usually captured electronically at time of registration
Date and time of discharge from ED	Usually captured manually and recorded electronically following discharge
Emergency department discharge status	Usually captured manually and recorded electronically following discharge
Acute Myocardial Infarction Diagnosis	Usually captured manually and recorded electronically following discharge
Reperfusion type	Captured and recorded manually only
Reason reperfusion not attempted	Not captured specifically, but can probably be interpreted from the patient's chart
Thrombolytic therapy start date and time	Captured and recorded manually only
Thrombolytic therapy delay reason	Not captured specifically, but can probably be interpreted from the patient's chart
Thrombolytic drug	Captured and recorded manually only

5.6.2. Delays

Both of the KPIs used in this study are dependent on capturing times at two different points in the patient's journey through the ED care process. The KPI measuring time from registration to discharge from the ED, transfer or admission to a hospital bed requires capturing and recording patient registration time following arrival in the ED and, secondly, the time the patient physically leaves the ED. The KPI measuring time to thrombolysis also requires capturing and recording patient registration time and, secondly, the time that thrombolysis therapy commenced. For each of the KPIs, there were a number of dependencies identified by the interviewees that can have an impact on a hospital's ability to achieve whatever target has been set for the KPI. Capturing this information can assist the hospital identify factors that may contribute to its ability to meet these targets. The headings used in this section are used to group potential delays according to where they may occur in the patient's journey through the ED.

5.6.2.1. Registration to Triage

In the study hospital, patients are not always triaged prior to registration. Some patients are first registered and are then directed to the waiting room to await triage. It was pointed out that this could potentially cause delays in time to thrombolysis for patients presenting with myocardial infarction, particularly in busy periods when there may be a number of people awaiting registration. At other times, it is likely that the staff member responsible for registering the patient may have the ability to identify patients that require urgent attention, based on information supplied during registration and will immediately call for professional attention for the patient.

Summary of findings

1. Not all patients are triaged immediately following presentation to ED.

5.6.2.2. Physician/ANP Assessment to Review

For the KPIs measuring time from registration to discharge, transfer or admission, patients are more likely to encounter delays if they require laboratory or radiology investigations as part of the assessment process. This can be due to the time it actually takes to carry out the investigation, but can also be due to the additional processes that are introduced to the patient journey by these investigations. Take for example a patient that presents with an uncomplicated laceration requiring sutures, wound dressing and perhaps the administration of a tetanus toxoid injection. The typical journey for that patient will involve registration, triage, and a period of waiting until a treatment room becomes available. When the treatment room becomes available, the patient will then receive the appropriate treatment and will be discharged home. If, however, the physician/ANP determines, that the patient requires additional investigations, such as an x-ray, this will then introduce additional processes that can cause potential delays in the patient's journey.

Radiographers are responsible for taking x-ray images, which, in this hospital, are stored electronically using Picture Archiving and Communications System (PACS). PACS records radiological images digitally that can then be viewed on screens, both in the radiology department and remotely in the ED. Radiographers are on duty in the hospital from 9am to 5pm and, during this time, any delays that patients experience are predominantly caused by periods of increased demand. It was also reported that patients appeared to

have to wait longer for x-rays between 12 noon and 2pm, possibly due to lunch breaks, and after 4.15pm, even though radiographers are on duty until 5pm.

X-ray images are then interpreted by a radiologist, who records an official report indicating the presence or absence of abnormalities. The radiologist is also present in the hospital between 9am and 5pm and, outside of this time, the attending clinician carries out a preliminary interpretation of x-ray images on which the patient's immediate treatment will be based. The radiologist will review the image on the next day and record an official report, which will either confirm the preliminary interpretation or record another diagnosis.

Once the x-ray is complete, the patient returns to the waiting room until the ED clinician, either accesses the report from the radiologist or views the image personally in the absence of the radiologist. During the time that the patient is in the radiology department, whatever clinician attended to the patient will continue assessing and treating other patients. There are no processes to ensure that the clinician will review the x-ray or the x-ray report as soon as it is available, and sometimes the patient can wait for extended periods while they await review by their attending clinician. The reason for the delay may be because the clinician is currently treating a patient with a complex complaint or the clinician may be treating other patients, unaware that the investigations ordered for an earlier patient are complete and the patient is awaiting review.

There is a radiographer on-call between 5pm and 9am. The time it takes for the radiographer to return to the hospital from home varies, depending on which radiographer is on-call. Obviously, this contributes to additional delays for ED patients in addition to those previously outlined.

Laboratory samples are usually collected from patients by ED staff and, as laboratory staff are present in the hospital 24 hours each day, there do not appear to be the same delays associated with laboratory investigations as with radiology. There can however be a delay from when the results are available to when they are reviewed by the attending clinician.

Priority is always given to patients requiring urgent attention and to children, and, if the physician is attending to either of these categories of patients, less urgent cases will have to wait longer. It was stated during one interview that main contributing factor to delays in the ED is the number of physicians employed in the ED. Physicians can only see a certain number of patients in a given time period and during periods of high patient volumes, it is inevitable that patients will have long delays for assessment and treatment.

Summary of findings

1. Patients are more likely to experience delays if they require clinical investigations, and in particular radiological investigations.
2. Patients are likely to experience delays at the point of review following the completion of investigations.

3. Paediatric patients and urgent cases are less likely to encounter unnecessary delays.

5.6.2.3. Referral to admission/discharge

A recent audit within the study hospital demonstrated that approximately 50% of all patients that visit the ED are referred by the ED physician/ANP for review by a speciality service such as medicine, surgery or orthopaedics. When a decision to refer the patient is made, the attending physician/ANP will phone a member of the speciality service to request a review. This can introduce significant delays in the patient journey. If, for example, the patient has been referred for surgical review and the surgical team are in the operating theatre, there may be a considerable delay until a member of the team is free to review the patient. Of all patient referrals, the largest number are referred to the speciality of medicine. To counteract delays for patients requiring medical review, a Senior House Officer (SHO) has been allocated from that speciality to the ED, specifically to review patients requiring medical review. It has been noticed that in the absence of this SHO, either due to annual leave or for any other reason, patients waiting times in the ED appear to increase, though this has not been scientifically measured. The ED treatment kardex contains a section for the time the patient is referred to a speciality service for review to be recorded. This is used within the ED by Emergency Medicine to monitor the performance of SHOs in relation to the number of patients each SHO treats within a given time period.

An additional delay identified in relation to patients referred to a speciality service is that the patient may have been referred to the inappropriate speciality. If, for example, a

patient is referred to medicine and the medical team determine that the patient should be assessed by the surgical team, that patient will then re-enter the referral cycle again at the beginning of the process. It was suggested that the availability of senior clinical decision makers within the ED would minimise this occurrence.

Approximately 50% of all patients that have been referred for review will be admitted, accounting for approximately 25% of all patients that visit the ED. The study showed there were no delays identified in the process of discharging a patient following the completion of the prescribed treatment.

The decision to admit a patient to this hospital can only be made by a physician from the speciality service under whose care the patient will be admitted. Once a decision is made to admit the patient, Bed Management will be contacted by phone to arrange a bed in the appropriate ward. Staff from the bed management department are present in the hospital from 8am to 8pm and outside of these hours bed management responsibilities are assumed by nurse management. Both bed management and nurse management staff visit the ED regularly to remain up to date on the profile of patients within the ED and plan for potential admissions in advance of the decision to admit.

Following the decision to admit, the patient will remain on a trolley in the ED until a bed is available. It was identified that during busy periods when high volumes of patients are seen and treated, resulting in a higher than average number of admissions to the hospital, patients will have to wait longer in the ED for a bed to become available. It was identified that these busy periods also contribute to delays for a number of days

following the busy period, resulting in extended waiting times for a bed, even though the volume of patients passing through the ED during that period is not particularly high.

It was identified that certain groups of patients may benefit from longer stays in the ED, and setting a specific target for time spent in the ED will not benefit this group of patients. One example given is elderly patients that may attend ED for conditions such as gastroenteritis or even constipation. Many of these patients can benefit from spending additional time in the ED to have their condition treated, which may include treatment such as rehydration. Even though treating these patients in ED will contribute to extended periods in ED, it may actually shorten their stay in hospital, as the process involved in admitting a patient to a hospital ward under a speciality service and the subsequent discharge process can be lengthier than the ED process. Shorter stays in hospital are presumed to be safer, as there are fewer opportunities for patients to be exposed to adverse risks associated with hospitalisation.

Summary of findings

1. Patients that are referred to a speciality service are likely to encounter delays as they await review by a physician from that service.
2. Designating a physician from the speciality services specifically to review ED patients can contribute to shorter delays for patients. It is not clear however, if middle grade cover is sufficient or is there a need for that physician to be a senior decision-maker.
3. Periods of increased activity in the ED can contribute to delays extending to a number of days following the busy period for patients awaiting an inpatient bed.

4. It may be inappropriate to use time spent in ED as a quality measure, as the provision of quality and safe care may involve spending longer periods in ED. Retaining the patient in ED for longer periods in order to provide relevant care may actually contribute to a shorter stay in hospital through the avoidance of admission to an inpatient bed.

5.7. Analysis

Are the data, as outlined in the KPI minimum data sets, currently being captured by the hospital information system?

The first data element listed in the proposed MDS is the MRN. Following the first interview, however, it was clear that the MDS would need to be amended to reflect ED practice, as the numbers applicable to all patients within the ED are the HIS number and the ED number. The MRN is only relevant to those patients who have had previous contact with the hospital as an inpatient, outpatient or day-case and have been issued with a chart.

As the ED number is only a temporary identifier used to record each episode of care and patients can have numerous ED numbers, it seems appropriate that the most suitable number for use in the MDS is the HIS number. For the purpose of collecting the data necessary for the KPIs on which this study is based, the MDS needs to be amended to incorporate the HIS number instead of the MRN, and this is captured and recorded electronically. The HIS number would also be suitable for capturing longitudinal data, such as return visits to the ED, as it is a unique identifier used for all patients that have

had contact with the hospital. The HIS and the MRN are linked once a patient has been assigned both and either number can be used for patient record retrieval.

The data elements in the MDS, patient first name, surname, date of birth, sex, and arrival date and time are captured electronically for all visits and do not appear to pose problems for the information system as components of the MDS.

The date and time of discharge from the ED and emergency department discharge status, are not routinely captured by the physician or the nursing staff on the treatment kardex, even though the treatment kardex contains a section for this purpose. It can be assumed that the date of discharge recorded in the PAS is accurate, however, the time recorded for discharge is frequently estimated. Further investigations are required to determine the accuracy of the estimated time of discharge.

The discharge status for all patients is not routinely recorded, however if patients are admitted to the hospital, this will be recorded and that level of detail would probably suffice for this KPI.

The diagnosis is recorded electronically but further investigation would also be warranted, possibly in the form of an audit, to determine the accuracy of diagnoses entered in the PAS.

Reperfusion type, reason reperfusion not attempted, thrombolytic therapy start date and time, thrombolytic therapy delay reason and thrombolytic drug are not recorded in the PAS.

What impact, if any, will the collection of data as outlined in the KPI minimum data sets have on systems and processes?

Recording the data required for the KPI measuring time from registration to discharge does not pose a problem for the PAS and, once entered in the PAS, it can easily be extracted for reporting purposes. The challenge to be overcome involves capturing the data, so that it can subsequently be entered in to the PAS, as it is not captured electronically at the point of care. In the absence of an electronic clinical records system, current processes dictate that data are captured manually and recorded electronically following the completion of each episode of care. As this data are not always captured, and frequently the time of discharge is estimated by clerical staff, the quality of the data may be called in to question.

For the KPI measuring time to thrombolysis, it seems appropriate that this data should be collected through audit, as the second time point required is the time drug administration commenced. This is clinical data that, in the absence of an electronic clinical records system, will be recorded manually in the patients chart and is not entered in to the PAS. Alternatively, the data required for this KPI may already be collected through an initiative monitoring cardiovascular disease and treatment. Currently there are a number of surveillance initiatives monitoring cardiovascular disease and treatments, including Coronary Heart Attack Register Ireland (CHAIR) and the Cardiology Audit and Registration Data Standards (CARDS). It would be appropriate to use these data sources, if the relevant data are already being captured, rather than burdening hospitals with additional data submissions. This detail should be determined

during the feasibility analysis, when it was being determined what data are currently being gathered.

Is there a need to collect additional local data to support the introduction of national targets?

In order to monitor performance against national targets, it may be necessary for the hospital to capture data at intermediate points in the patient's journey from registration to discharge, transfer or admission. These data can then be analysed to assist the hospital improve performance by identifying reasons for poor performance and informing changes in practice that may need to be instituted as a result of the analysis.

During the interviews a number of issues were identified that may contribute to the capability of the hospital to meet specific targets associated with the chosen KPIs. Even though a number of reasons for delays in the patient journey were identified through interview, it would be necessary to systematically capture data to support these views and to plan changes based on confirmed data rather than expressed opinions. The difficulty though, is how to capture data that are not currently recorded electronically and cannot be extracted from the PAS. During the interviews it became clear that even though the KPI measuring time to discharge, transfer or admission only required capturing two time points in the patient journey, the second point i.e. the time the patient left ED, is not always recorded. Nursing and medical staff were frequently reminded to record these data with limited success. It could be that the relevance of recording this information is not clear to staff, as in the absence of educating staff on the relevance of data, its importance is not always readily identifiable. As stated earlier

in this paper, KPIs and the data necessary to support the measurement need to be relevant to those responsible for collecting the data.

Alternatively, it may be necessary to examine alternative ways to capture the data. KPIs based on data collected as a by-product of the care process do not place an excessive burden on the system and are more likely to be collected. When developing KPIs, it may be appropriate to map the patient care process, to identify where and when the data elements contained in the MDS can, and are most likely to, be collected.

The main reason cited for delays in the patient journey through the ED are related to radiological investigations, particularly out-of-hours, and the time to review following the availability of results of investigations. In relation to radiological investigations, it may be possible to capture data detailing any delays that the patient may encounter specifically related to the radiology department, as the investigations are ordered electronically, stored electronically and reported electronically, during core hours. This should facilitate the identification of unreasonable time delays, if any, between specific points in the radiology process.

Capturing data about potential delays from the time results are available to the time of review is more difficult, as the time of review is not captured electronically. Manually capturing the data in paper format is dependent on physicians/ANP and nurses recording these data, and based on interviews with ED staff, physicians and nurses have historically been poor at recording this type of data. Further analysis of the reason why physicians and nurses do not record the time of specific interventions may be warranted,

in order to identify potential solutions. Again, this may be due to the perception that this data is irrelevant to patient care.

Chapter 6: Conclusion, Recommendations and Future Work

6.1. Conclusion

6.1.1. Introduction

The objective of this dissertation was to contribute to the process of monitoring the performance of healthcare using KPIs. This was achieved through providing an overview of healthcare quality and methods of monitoring quality and proposing a set of guidelines for the development of KPIs. The guidelines are based on an extensive literature review and outline a systematic approach to developing KPIs to ensure the resulting information is valid and reliable. The dissertation then identified KPIs that are used internationally for monitoring the performance of EDs and outlined an impact assessment of capturing data required for selected KPIs.

6.1.2. Findings

The impact assessment has shown that, in the absence of integrated electronic clinical and patient administration systems, it is difficult to capture and record all of the data contained in the MDS. The data from the MDS that are recorded electronically by the information system are captured through the patient registration process and can be considered reliable. The clinical data required for the MDS, such as thrombolysis administration time, are captured manually and can also be considered reliable. Other data that are captured manually and subsequently recorded electronically, such as discharge time, are less reliable, as they are not routinely captured as part of the process of care.

While the HIS number would satisfy the requirements of the MDS for this hospital, there is a need for further investigation to determine how patients are identified uniquely in

other hospitals. The difficulties arising from using different numbers to identify a patient in the same facility, as outlined in the previous chapter, is a valid argument in support of the introduction of a UHI to identify the patient uniquely within and across healthcare facilities.

It was evident from the impact assessment that healthcare personnel do not view data collected for performance monitoring as an intrinsic component of the provision of healthcare. Using the guidelines as a guide to developing KPIs should contribute to the identification of priority areas to be addressed when developing KPIs and the associated MDS. This includes engaging with stakeholders to identify information needs and to utilise their expertise to ensure that the KPIs are not only relevant, but also seen to be relevant by those responsible for data collection. Ideally, data collected for performance monitoring should also be relevant to the provision of patient care. Using the guidelines will support the process of benchmarking and performance improvement by gathering data that supports the provision of consistent and timely information to decision-makers.

The impact assessment also demonstrated that delays in the ED are the result of a combination of factors, both intrinsic and extrinsic to the department. It is not sufficient, however, to base decisions that may involve the reconfiguration of services on the perceptions of staff, without valid and reliable data to support those perceptions. For example, should the radiology service be re-engineered so that a radiographer is on site 24 hours each day, without reliable data to support that an on-call radiographer contributes to delays. It is therefore necessary to collect local data to support the implementation of national targets.

The provision of safe and effective care within EDs involves identifying patient's needs and responding in a timely manner. Ideally, all patients should be triaged by a suitably qualified healthcare professional as soon as they present to the ED, without having first to be registered in the PAS. This can be a preliminary triage to determine the nature of the presenting complaint to determine if immediate attention is required, with a more detailed triage to take place following registration. It is accepted that registration was not identified as a prerequisite to triage, but it appears that in practice only a minority of patients are triaged prior to registration.

One of the main findings of the impact assessment is the need for a Unique Health Identifier to uniquely identify patients within and across healthcare settings. Having numerous identifiers can result in duplicate records for the same patient with neither of them being complete, resulting in unsafe care. A unique identifier is, perhaps, the first step in the process towards electronic health records, which will facilitate the sharing of healthcare data and enhance the effectiveness and safety of healthcare.

6.2. Recommendations

The following are recommendations made as a result of the impact assessment:

1. There is a need to upgrade Information Technology (IT) systems in EDs to capture data to facilitate the delivery of safe care and for quality assurance purposes.
2. There is an urgent need for the introduction of a Unique Health Identifier to uniquely identify patients within and between hospitals, and between primary and secondary care.

3. When developing KPIs, it is necessary to engage with staff working in EDs to determine where and when the necessary data will be captured in the patient journey.
4. There is a requirement for a data dictionary to support the development of standard data definitions, which will contribute to consistent data collection across the healthcare system and facilitate benchmarking
5. There is a need to collect additional local data to support the introduction of national targets and data collected for national targets should be utilised locally to inform decision-making.
6. All patients should have preliminary triage by a healthcare professional prior to registration to determine if they need immediate attention.
7. The development of electronic clinical records should be a target of the health service. Electronic clinical records support performance monitoring through facilitating the capture and recording of data necessary for performance monitoring in a reliable manner. This data can then be extracted with minimal burden on the healthcare system and staff.
8. If "time spent in ED" is to be used as a quality measure, it is necessary to take into consideration those patients that actually benefit from spending extended periods in ED for assessment and treatment purposes, when developing the KPI.

6.2.1. Limitations of the study

It is accepted that this study is based on the views and perceptions of a limited number of personnel from an individual healthcare facility. A more scientific method of carrying out an impact assessment would involve implementing the KPIs in one or more pilot

sites an assessing the impact, based on actual data collection. This, however, was not within the scope of this project.

6.3. Future work

A number of countries using KPIs to measure the performance of their EDs use some aspect of time measurement in their suite of KPIs. However, before using the total time patients spend in EDs for performance monitoring purposes, it may be beneficial to analyse the patient profile attending EDs to ensure that patients that may benefit from longer periods in ED are not put at risk as a result of an organisation's attempt to meet targets.

The guidelines for developing KPIs developed for this study may need to be revised based on feedback and assessment, following their use in actually guiding the process of developing KPIs in practice.

Reference List

- (1) Donabedian A. The Quality of Care: How Can It Be Assessed? *Journal of the American Medical Association* 1988;260(12):1743-8.
- (2) Department of Health and Children. *Health in Ireland, Key Trends 2007*. Dublin: Department of Health and Children; 2007.
- (3) Sheldon T. Promoting health care quality: what role performance indicators? *Quality in Health Care* 1998;7(Supplement):S47-S50.
- (4) Health Service Executive. *Annual Report and Financial Statements 2008*. Health Service Executive; 2009.
- (5) PA Consulting Group. *Acute Hospital Bed Capacity Review: A Preferred Health System in Ireland to 2020*. Health Service Executive; 2007.
- (6) Health Information and Quality Authority. *Report of the investigation into the circumstances surrounding the provision of care to Rebecca O'Malley, in relation to her symptomatic breast disease, the Pathology Services at Cork University Hospital and Symptomatic Breast Disease Services at the Mid Western Regional Hospital, Limerick*. Health Information and Quality Authority; 2008.
- (7) Health Information and Quality Authority. *Report of the investigation into the quality and safety of services and supporting arrangements provided by the Health Service Executive at the Mid-Western Regional Hospital Ennis*. Health Information and Quality Authority; 2009.
- (8) Deloitte & Touche. *Value for Money Audit of the Irish Health System*. Department of Health and Children; 2001.
- (9) Comhairle na nOspidéal. *Report of the Committee on Accident and Emergency Services*. Dublin: Comhairle na nOspidéal; 2002.
- (10) Prospectus. *Audit of Structures and Functions in the Health System*. The Stationary Office, Dublin: Department of Health and Children; 2003.
- (11) Tribal Secta. *A&E Mapping and Efficiency Review Across 10 National Hospitals - Overview Report*. Health Service Executive; 2005.
- (12) Health Service Executive. *Emergency Department Task Force Report*. Health Service Executive; 2007.

- (13) Beattie E, Mackway-Jones K. A delphi study to identify performance indicators for emergency medicine. *Emergency Medicine Journal* 2004;21:47-50.
- (14) Dreyfus SE, Dreyfus HL. A Five Stage Model of the Mental Activities involved in Directed Skill Acquisition. University of California, Berkeley: Unpublished Report; 1980.
- (15) Øvretveit J. Formulating a health quality improvement strategy for a developing country. *International Journal of Health Care Quality Assurance* 2004;17(7):368-76.
- (16) Silimperi D, Miller Franco L, Veldhuyzen Van Zanten T, Macaulay C. A framework for institutionalising quality assurance. *International Journal for Quality in Health Care* 2002;14, Supplement 1:67-73.
- (17) Donabedian A. *An Introduction to Quality Assurance in Health Care*. Oxford University Press; 2003.
- (18) Institute of Medicine. Health, Health Care, and Quality of Care. In: Kathleen N.Lohr, editor. *Medicare: A Strategy for Quality Assurance*. 1 ed. 1990. p. 21.
- (19) McGlynn EA. Six Challenges in Measuring the Quality of Health Care. *Health Affairs* 1997;16(3).
- (20) Mant J. Process versus outcome indicators in the assessment of quality of health care. *International Journal for Quality in Health Care* 2001;13(6):475-80.
- (21) Miller T, Leatherman S. The National Quality Forum: A 'Me-Too' or a Breakthrough in Quality Measurement and Reporting? *Health Affairs* 1999;18(6):233-7.
- (22) Arah OA, Westert GP, Hurst J, Klazinga NS. A conceptual framework for the OECD Health Care Quality Indicators Project. *International Journal for Quality in Health Care* 2006;5-13.
- (23) Kelley E, Hurst J. Health Care Quality Indicators Project. Organisation for Economic Co-operation and Development; 2006. Report No.: Health Working Papers No. 23.
- (24) National Patient Safety Foundation. *Agenda for research and development in patient safety*. 2000. Chicago, IL, National Patient Safety Foundation.

- (25) Arah OA, Klazinga N, Delnoij DMJA, Ten Asbroek AHA, Custers T. Conceptual frameworks for health systems performance: a quest for effectiveness, quality and improvement. *International Journal for Quality in Health Care* 2003;15:377-98.
- (26) Shaw C. How can hospital performance be measured and monitored? World Health Organisation; 2003.
- (27) Selznick P. Focussing organizational research on regulation. Berkeley: The University of California Press; 1985.
- (28) Turpin RS, Darcy LA, McMahill C, Meyne K, Morton D, Rodriguez J, et al. A Model to Assess the Usefulness of Performance Indicators. *International Journal for Quality in Health Care* 1996;8(4):321-9.
- (29) Kelley E, Arispe I, Holmes J. Beyond the initial indicators: lessons from the OECD Health Care Quality Indicators Project and the US National Healthcare Quality Report. *International Journal for Quality in Health Care* 2006;45-51.
- (30) Pringle M, Wilson T, Grol R. Measuring "goodness" in individuals and healthcare systems. *British Medical Journal* 2002 Sep 28;325:704-7.
- (31) Campbell SM, Braspenning J, Hutchinson A, Marshall M. Research methods used in developing and applying quality indicators in primary care. *Quality and Safety in Health Care* 2002;11:358-64.
- (32) Mainz J. Defining and classifying clinical indicators for quality improvement. *International Journal for Quality in Health Care* 2003;15(6):523-30.
- (33) Helfert M, Henry P, Leist S, Zellnor G. Healthcare performance indicators - Preview of frameworks and an approach for healthcare process-development. *Proceedings of The 2005 International Business Information Management Conference, July 5 - 7 Lisbon, Portugal, 2005 p. 371-8.*
- (34) McLoughlin V, Leatherman S, Fletcher M, Owen JW. Improving performances using indicators. Recent experiences in the United States, United Kingdom and Australia. *International Journal for Quality in Health Care* 2009;13(6):455-62.
- (35) Audit Commission. On Target: the practice of performance indicators. Audit Commission for Local Authorities and the National Health Service in England and Wales; 2000.
- (36) Commission for Healthcare Audit and Inspection. Investigation into Mid Staffordshire NHS Foundation Trust. Healthcare Commission; 2009.

- (37) Healthcare Commission. The Better Metrics project. Healthcare Commission; 2007. Report No.: Version 8.
- (38) McGlynn E, Asch S. Developing a Clinical Performance Measure. *American Journal of Preventive Medicine* 1998;(14):14-21.
- (39) Mainz J. Developing evidence-based clinical indicators: a state of the art methods primer. *International Journal for Quality in Health Care* 2003;15(Supplement 1):i5-i11.
- (40) Rubin HR, Pronovost P, Diette GB. From a process of care to a measure: the development and testing of a quality indicator. *International Journal for Quality in Health Care* 2001;13(6):489-96.
- (41) AIHW. A guide to data development. Australian Institute of Health and Welfare (AIHW); 2007. Report No.: AIHW Cat. no. HWI 94.
- (42) WHO. Mental Health Information Systems (Mental Health Policy and Service Guidance Package). World Health Organisation; 2005.
- (43) Kristensen S, Mainz J, Bartels P. Establishing a Set of Patient Safety Indicators: Safety Improvement for Patients in Europe. *European Society for Quality in Health Care*; 2007. Report No.: WP4.
- (44) Rivard P, Rosen A, Carroll J. Enhancing Patient Safety through Organisational Learning: Are Patient Safety Indicators a Step in the Right Direction? *Health Research and Educational Trust* 2006;41(4p2):1633-53.
- (45) Millar J, Mattke S. Selecting Indicators for Patient Safety at the Health Systems Level in OECD Countries. Organisation for Economic Co-operation and Development; 2004. Report No.: OECD Health Technical Papers No.18.
- (46) Ballantine J, Brignall S, Modell S. Performance measurement and management in public health services: a comparison of UK and Swedish practice. *Management Accounting Research* 1998;9:71-4.
- (47) Kaplan RS, Norton DP. The Balanced Scorecard - Measures that Drive Performance. *Harvard Business Review* 1992;70(1):71-9.
- (48) Kelley E, Hurst J. Health Care Quality Indicators Project Conceptual Framework Paper. Organisation for Economic Co-operation and Development; 2006. Report No.: Health Working Papers No. 23.
- (49) Mainz J. The National Indicator Project. *Health Policy Monitor* 2008 Available from: URL: <http://www.hpm.org/survey/dk/a12/3>

- (50) Bodart C, Shresta L. Identifying information needs and indicators. WHO, Design and implementation of health information systems. Geneva: World Health Organisation; 2000. p. 49-72.
- (51) Sutherland K, Leatherman S. Regulation and Quality Improvement: A review of the evidence. London: The Health Foundation; 2006.
- (52) Committee on Quality of Healthcare in America IoM. To Err is Human: Building a Safer Health System. Washington: National Academy Press; 2000.
- (53) Crerand WJ, Lamb J, Rulon V, Karal B, Mardekian J. Building Data Quality into Clinical Trials. Journal of AHIMA 2002;73(10):44-8.
- (54) AIHW. National Health Data Dictionary: Version 14. Canberra, Australia: Australian Institute of Health and Welfare; 2008.
- (55) ISO/IEC 11179-1. Information technology - Metadata registries (MDR). 2004 Sep 15.
- (56) Kazandjia V, Reid T. Healthcare Performance Measurement. American Society for Quality; 1999.
- (57) Healthcare Commission. The Annual Health Check 2008/2009. Commission for Healthcare Audit and Inspection; 2008.
- (58) Healthcare Commission. Review of Urgent and Emergency Care 2007/2008: Scoring framework. Healthcare Commission; 2008.
- (59) Quality Health New Zealand. <http://www.qualityhealth.org.nz/default.asp> 2009
- (60) Canadian Institute of Health Information. http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=home_e 2009 [cited 2009 Jun 22];
- (61) Australian Institute of Health and Welfare. <http://www.aihw.gov.au/index.cfm> 2009 [cited 2009 Jun 22];
- (62) Australian Institute of Health and Welfare. Australia's health 2008. Canberra: Australian Institute of Health and Welfare; 2008.
- (63) Australian Institute of Health and Welfare. A set of performance indicators across the health and aged care system. Australian Institute of Health and Welfare; 2008.

- (64) National Institute for Public Health and the Environment. Dutch Healthcare Performance Report 2008. National Institute for Public Health and the Environment; 2006.
- (65) Government of Ireland. Health Act 2007. Number 23 of 2007. 2007.
Ref Type: Statute
- (66) Health Information and Quality Authority. National Standards for the Prevention and Control of Healthcare Associated Infections. Health Information and Quality Authority; 2009.
- (67) Health Information and Quality Authority. Standards for Residential Care Settings for older people. Health Information and Quality Authority; 2009.
- (68) Health Information and Quality Authority. National Quality Standards: Residential Services for People with Disabilities. Health Information and Quality Authority; 2009.
- (69) Health Service Executive. HSE Website. <http://www.hse.ie/eng/2009> [cited 2009 Jun 24];
- (70) Health Service Executive. HSE National Service Plan 2009. Health Service Executive; 2009. <http://www.hse.ie/eng/2009>
- (71) HSE. Healthstat for Hospitals Guide. 27-5-2009. Health Service Executive.
- (72) Dykstra EH. International models for the practice of emergency care. *American Journal of Emergency Medicine* 1997;15(2):208-9.
- (73) Cronin JG. The introduction of the Manchester triage scale to an emergency department in the Republic of Ireland. *Accident and Emergency Nursing* 2003;11(2):121-5.
- (74) HSE. A&E Departments, Background Briefing. Health Service Executive; 2006.
- (75) Miller JN. The art of intelligent listening. *Readers Digest* 127. 1965.
Ref Type: Magazine Article
- (76) Britten N. Qualitative Research: Qualitative interviews in medical research. *British Medical Journal* 1995;311:251-3.
- (77) Zhang Y, Wildemuth B. Unstructured Interviews. http://ils.unc.edu/~yanz/Unstructured_interviews.pdf 2006 July 4 [accessed 2009 Jul 8];

(78) Bates JA. Use of Narrative interviewing in everyday information behavior research. *Library & Information Science Research* 2004;26:15-28.

Appendices:

Appendix 1: Emergency Department wait time KPI

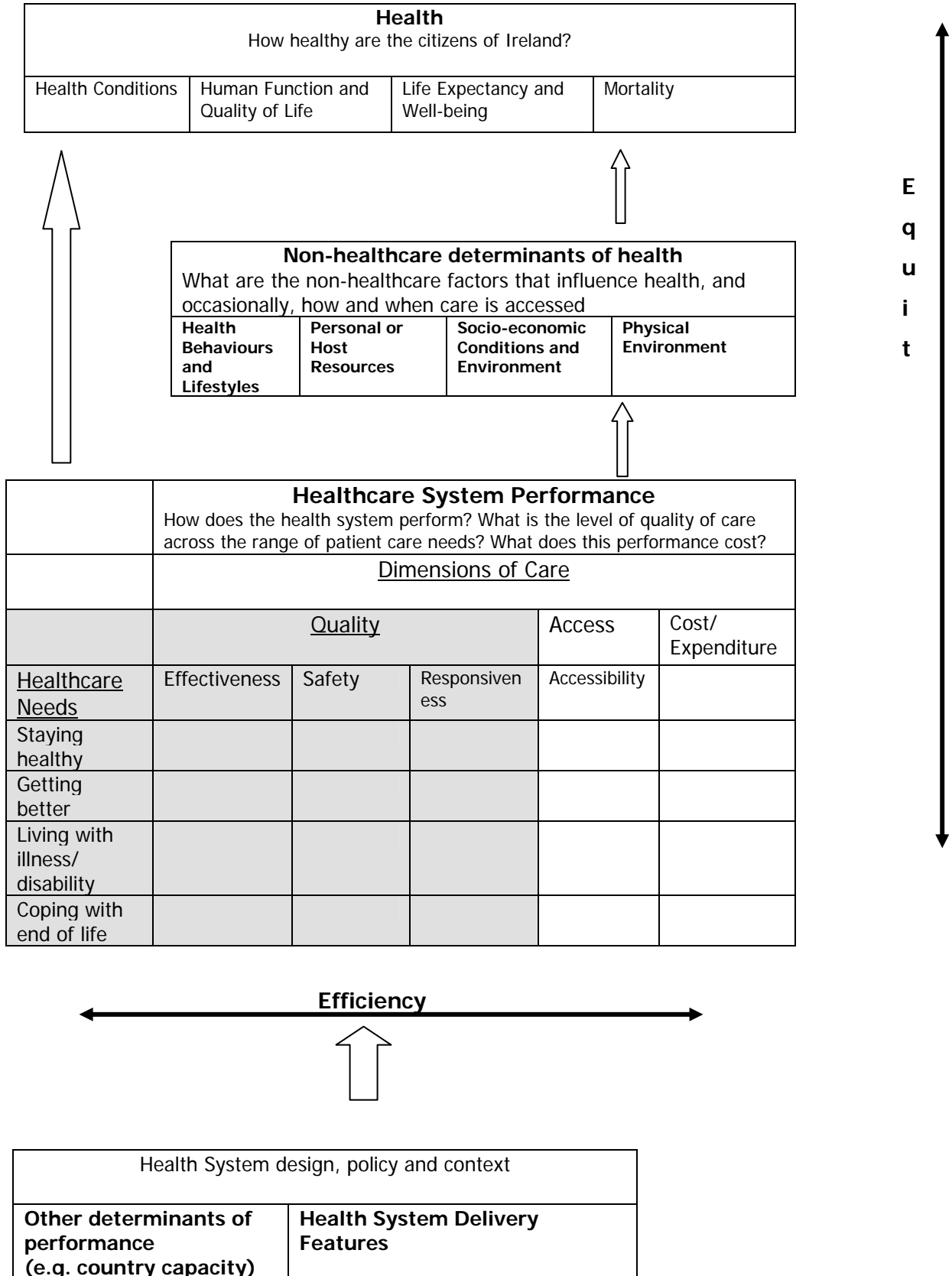
Indicator Name	Emergency Department Length of Stay
Description	Length of Stay begins at the time of first patient encounter in the emergency department, either the time of triage nurse assessment or time of patient registration, whichever comes first. Ends when the patient departs the emergency department to home/long-term care home OR to an inpatient bed, an operating room, a critical care bed, a clinical decision unit adjacent to the emergency department or another facility.
Rationale	Prolonged waiting times for patients in the emergency Department are associated with reduced patient satisfaction and with high rates of re-presentation and poorer health outcomes. Reducing waiting times has been identified as a priority area by the Department of Health and Children and the Health Service Executive.
Quality Dimension	<input type="checkbox"/> Safety <input checked="" type="checkbox"/> Effectiveness <input type="checkbox"/> Efficiency <input checked="" type="checkbox"/> Access & fairness
Type of Indicator	<input type="checkbox"/> Structure <input checked="" type="checkbox"/> Process <input type="checkbox"/> Outcome <input checked="" type="checkbox"/> Generic <input type="checkbox"/> Disease specific <input type="checkbox"/> Preventive <input checked="" type="checkbox"/> Acute <input type="checkbox"/> Chronic <input type="checkbox"/> Screening <input type="checkbox"/> Diagnostic <input checked="" type="checkbox"/> Treatment <input type="checkbox"/> Follow-up
Numerator	The number of patients spending six hours or less in an emergency department.
Denominator	The total number of patients attending at an A&E department.
Target	At least 98% < 6 hours

Appendix 2: Time to thrombolysis KPI

Indicator Name	Time to Thrombolysis
Description	Percentage of patients with Acute Myocardial Infarction (AMI) requiring thrombolysis who receive thrombolytic therapy within 60 minutes of presentation to the Emergency Department
Rationale	Cardiovascular disease is the leading cause of death in Ireland and research indicates that mortality is directly proportional to the time delay from onset of symptoms to the commencement of definitive therapy. The Cardiovascular Health Strategy in Ireland recommends that eligible patients receive thrombolysis within 90 minutes of seeking professional help. In the United Kingdom the Coronary Heart Disease National Service Framework sets out that patients suffering from Myocardial Infarction should receive thrombolysis within 60 minutes of calling for professional help.
Quality Dimension	<input type="checkbox"/> Safety <input checked="" type="checkbox"/> Effectiveness <input type="checkbox"/> Efficiency <input checked="" type="checkbox"/> Access & fairness
Definition of Terms	<p><i>Acute Myocardial Infarction</i> can be diagnosed when there is a rise and/or fall of cardiac biomarkers (preferably troponin) with at least one value above the 99th percentile of the upper reference limit (URL) together with evidence of myocardial ischaemia with at least one of the following:</p> <ul style="list-style-type: none"> • Symptoms of ischaemia • ECG changes indicative of new ischaemia ((new ST – T changes or new left bundle branch block (LBB)) • Development of pathological Q waves on the ECG • Imaging view of new loss of viable myocardium or new regional wall motion abnormality <p><i>Thrombolytic therapy</i> is defined as intravenous therapy for the purpose of enhancing clot lysis.</p> <p><i>Time of presentation</i> is defined as arrival time</p>
Type of Indicator	<input type="checkbox"/> Structure <input checked="" type="checkbox"/> Process <input type="checkbox"/> Outcome

	<input type="checkbox"/> Generic <input checked="" type="checkbox"/> Disease Specific <input type="checkbox"/> Preventive <input checked="" type="checkbox"/> Acute <input type="checkbox"/> Chronic <input type="checkbox"/> Screening <input type="checkbox"/> Diagnostic <input checked="" type="checkbox"/> Treatment <input type="checkbox"/> Follow-up
Numerator	Total number of patients with a diagnosis of AMI requiring thrombolytic therapy who receive thrombolysis within 60 minutes of presentation to the Emergency Department
Denominator	Total number of patients with a diagnosis of AMI requiring thrombolysis who receive thrombolytic therapy following presentation to the Emergency Department
Tracer conditions	Acute Myocardial Infarction (AMI) <i>Synonyms:</i> Myocardial Infarction (MI) Cardiac Infarction Heart Attack <u>SNOMED CT:</u> ConceptID 22298006 <i>ICD-10-AM codes:</i> 121.0, 121.1, 121.2, 121.3, 121.4, 121.5, 121.9
Inclusion criteria	<i>Numerator:</i> Total number of patients with a diagnosis of AMI requiring thrombolysis who receive thrombolytic therapy within 60 minutes of presentation to the Emergency Department
	<i>Denominator:</i> Total number of patients with a diagnosis of AMI requiring thrombolysis who receive thrombolytic therapy following presentation to the Emergency Department
Target	<ul style="list-style-type: none"> • Deliver a 10% increase year on year
Data source	<ul style="list-style-type: none"> • Administrative data • Medical Record
Observation time	1 st January 2010 to 30 th June 2010
Int'l Comparison	Healthcare Commission, UK

Appendix 3: HCQI Framework



Appendix 4: Delphi Study example of Brief Assessment Instrument

Scoring Matrix				
Dimension	Definition			Score
Validity	Is the indicator satisfactory in terms of: <ul style="list-style-type: none"> • Face validity • Content validity 			1 – 3 Low degree of relevance 4 – 6 Medium degree of relevance 7 – 9 High degree of relevance
Reliability	Is the indicator satisfactory in terms of reliability?			1 – 3 Low degree of relevance 4 – 6 Medium degree of relevance 7 – 9 High degree of relevance
Acceptability	Is the indicator acceptable?			1 – 3 Low degree of relevance 4 – 6 Medium degree of relevance 7 – 9 High degree of relevance
Feasibility	How is the: <ul style="list-style-type: none"> • Availability of data • Clinical burden of data collection 			1 – 3 Low degree of relevance 4 – 6 Medium degree of relevance 7 – 9 High degree of relevance
Scoring Sheet				
Title:				
Scores				
Validity	Reliability	Acceptability	Feasibility	
Additional Comments				

Appendix 5: Daily ED Report

Report Name	Daily ED Report
ProviderCode	
Provider	
Date	
Day	
Time	
Month	
Year	

It is imperative that the following definition be applied to patient's waiting times measured at 8am and 2pm for people in ED and admission lounges / transition facilities (if applicable). Patients in Medical Assessment/Admission Unit should not be included in these figures but should be included in Part 3 below if awaiting admission to an inpatient bed

1. Decision to admit time is defined as the time at which the emergency doctor refers the patient to the in-patient team for admission

2. Patient numbers are counted based on the number of persons in the following places from when the decision to admit has been made

	Patient waiting numbers	Category	Insert number here
1	ED treatment places Number of patients located in ED on chairs or trolleys awaiting admission from decision to admit time at 8am or 2pm (broken down into length of waiting time categories)	a) From 0 to 6 hours*	
		b) From 6 to 12 hours*	
		c) From 12 to 24 hours*	
		d) Greater than 24 hours*	
2	ED other area e.g. observation ward Number of patients in ED waiting in inappropriate observation beds where there has been a decision to admit at 8am or 2pm	a) From 0 to 6 hours*	
		b) From 6 to 12 hours*	
		c) From 12 to 24 hours*	
		d) Greater than 24 hours*	
3	Outside ED e.g. Day wards Number of patients not in ED but awaiting admission elsewhere in the hospital at 8am or 2pm . Not in an inpatient setting. <i>(EXCLUDES ADMISSION LOUNGE / TRANSIT FACILITY BUT INCLUDES MEDICAL ASSESSMENT/ ADMISSION UNIT)</i>	a) From 0 to 6 hours*	
		b) From 6 to 12 hours*	
		c) From 12 to 24 hours*	
		d) Greater than 24 hours*	
4	Admission Lounges Number of patients in an Admission Lounge / Transit Facility awaiting admission at 8am or 2pm (broken down into length of waiting time categories)	a) From 0 to 6 hours*	
		b) From 6 to 12 hours*	
		c) From 12 to 24 hours*	
		d) Greater than 24 hours*	

***Please ensure that patient times are measured according to the definition above**

Appendix 6: Sample excerpt from Performance Monitoring Report (PMR)

Acute Hospital Services and Pre-Hospital Emergency Care

In our NSP 2009, the HSE committed to providing information on the total time patients experience in ED from the time they register to the time they leave the ED department. This measure has a number of advantages over focusing on admission waits. Such advantages include:

- It more closely approximates the experience of ED patients by measuring all their steps compared to only one part of the journey (from decision to admit to admission).
- Approximately 75% of patients who attend ED do not require admission. The total time these patients experience has not been systematically collected previously.

The HSE is currently undertaking a project to provide all EDs nationally with an information systems solution to collect this information from all hospitals. In the interim, hospitals who cannot provide this information are currently participating in a daily sampling exercise to capture this data. Table A outlines the result of February and March information which combines information from hospitals that provide the information based on all attendances at ED (AA) and information from hospitals who used the sampling methodology (S). As hospitals' ICT systems undergo modification during quarter 2 of 2009, the sampling methodology will cease and information from all attendances will be inserted.

The table below shows the percentage of patients' ED experience time for both non-admitted and admitted patients (from sample only). The sample is based on over 4,500 reported ED times from a variety of hospitals. As can be seen, for non-admitted patients, 92% of patients were discharged within 6 hours and 95% within 12 hours (cumulatively). However, only 45% of patients who require admission are admitted within the target time of 6 hours from their first presentation at ED. Fifteen percent of patients wait more than 24 hours for admission.

Table A: % of pts experience time by time bands

% discharged within	All patients	Non-Admitted patients	Admitted patients
3 hrs	71%	79%	25%
6 hrs	85%	92%	45%
12 hrs	89%	95%	59%
24 hrs	96%	98%	85%
> 24 hrs	4%	2%	15%

The table on the right shows the average ED patient experience time across hospitals. As can be seen, 21 hospitals have an average patient experience time of less than 6 hours and 4 hospitals have patient experience times of more than 12 hours. The average ED

patient experience time for patients not requiring admission is less than 6 hours across many hospitals. For patients requiring admission, 15 hospitals have an average experience time of more than 6 hours.

Average total ED patient experience time by hospital

	Data Type	All Patients	Non admitted	Admitted
Nenagh Hospital	S	1.0	1.0	0.9
Louth County Hospital	S	1.4	1.4	-
St. John's Hospital	S	1.7	1.7	3.4
St. Lukes	S	1.7	1.7	2.8
Roscommon Hospital	S	1.8	1.8	2.3
St. Michaels	S	2.1	2.0	3.2
South Tipperary	S	2.2	1.5	4.9
South Infirmary	S	2.2	1.8	8.1
Midland Reg'l - Tullamore	AA	2.4	2.0	3.6
Wexford Hospital	S	2.5	2.4	3.9
Our Lady's - Navan	S	2.5	2.1	6.0
Kerry General	AA	2.6	2.5	3.2
Portiuncula Hospital	AA	2.8	2.8	3.0
Waterford Regional	S	2.8	2.0	7.8
Mater Hospital	S	3.0	2.7	9.7
Letterkenny Hospital	AA	3.3	5.0	2.5
Mayo General Hospital	S	3.5	2.5	9.8
Mercy Hospital	S	4.0	3.4	13.8
Cavan	S	4.5	2.9	9.3
CUH	AA	5.7	5.8	5.4
Regional Hosp- Dooradoyle	AA	5.8	4.8	8.3
AMNCH	AA	6.5	6.4	6.6
St. James Hospital	AA	8.7	6.9	14.8
SVH	AA	9.4	7.3	9.4
Naas General Hospital	S	9.4	5.9	24.1
UCHG	S	10.5	7.4	16.5
Beaumont Hospital	AA	12.2	8.2	27.9
Our Lady of Lourdes	S	23.8	25.1	23.1
Connolly Hospital	S	30.1	33.0	27.0

* **S** = Data using sampling method; **AA** = Data from all attendances

Appendix 7: Weekly Activity Report

ReportName	Weekly Activity Report							
HOSPITAL	Week ending							
New attendances (Emergency Department (ED) ONLY)	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
a) No. new attendances between 00:00- 03:59hrs								0
b) No. new attendances between 04:00- 07:59hrs								0
c) No. new attendances between 08:00- 11:59hrs								0
d) No. new attendances between 12:00- 15:59hrs								0
e) No. new attendances between 16:00- 19:59hrs								0
f) No. new attendances between 20:00- 23:59hrs								0
Total New Attendances	0	0	0	0	0	0	0	0
Return attendances (ED ONLY)								
a) No. return attendances between 00:00- 03:59hrs								0
b) No. return attendances between 04:00- 07:59hrs								0
c) No. return attendances between 08:00- 11:59hrs								0
d) No. return attendances between 12:00- 15:59hrs								0
e) No. return attendances between 16:00- 19:59hrs								0
f) No. return attendances between 20:00- 23:59hrs								0
Total Return Attendances	0	0	0	0	0	0	0	0
Other Emergency Attendances								
a) Emergency presentations direct to wards (except for MAU's)								0
b) Medical Assessment Unit (MAU) Attendances (all attendances)								0
Mode of arrival of new attendances (ED ATTENDANCES ONLY)								
a) Ambulance								0
b) Other								0
c) Total	0	0	0	0	0	0	0	0
Mode of New attendances by referral type (ED ATTENDANCES ONLY)								
a) GP referral 00.00 - 07.59hrs								0
b) GP referral 08.00 - 19.59hrs								0
c) GP referral 20.00 - 23.59hrs								0
d) GP referral Total	0	0	0	0	0	0	0	0
Patients admitted to an in house consultant, but treated and discharged within the ED without gaining access to an inpatient bed								
a) No. patients								0
Number of New Attendances by Triage category								
a)Triage Category 1								0
b)Triage Category 2								0
c)Triage Category 3								0
d)Triage Category 4								0
e)Triage Category 5								0
f)Other /not classified								0
Total	0	0	0	0	0	0	0	0
Total time in ED								
Total time of all attendances (in minutes)								0
Number of attendances per day that where subsequently admitted								0
Total time (in minutes) of attendances who where subsequently admitted								0
Total number of attendances referred to an in-house team								0
Number of attendances referred and seen by in-house team within 60 minutes								0
Number of attendances where total time in Emergency Department was between 0 and 3 hours								0
Number of attendances where total time in Emergency Department was between 3 and 6 hours								0
Number of attendances where total time in Emergency Department was between 6 and 12 hours								0
Number of attendances where total time in Emergency Department was between 12 and 24 hours								0
Number of attendances where total time in Emergency Department was greater than 24 hours								0
Number of Emergency Admissions who waited less than 6 hours for a bed								0
Number of Emergency Admissions who waited less than 12 hours for a bed (incl 6 hours)								0

Appendix 8: Example of 2pm Census

2pm A&E Figures calculated for 23/06/2009

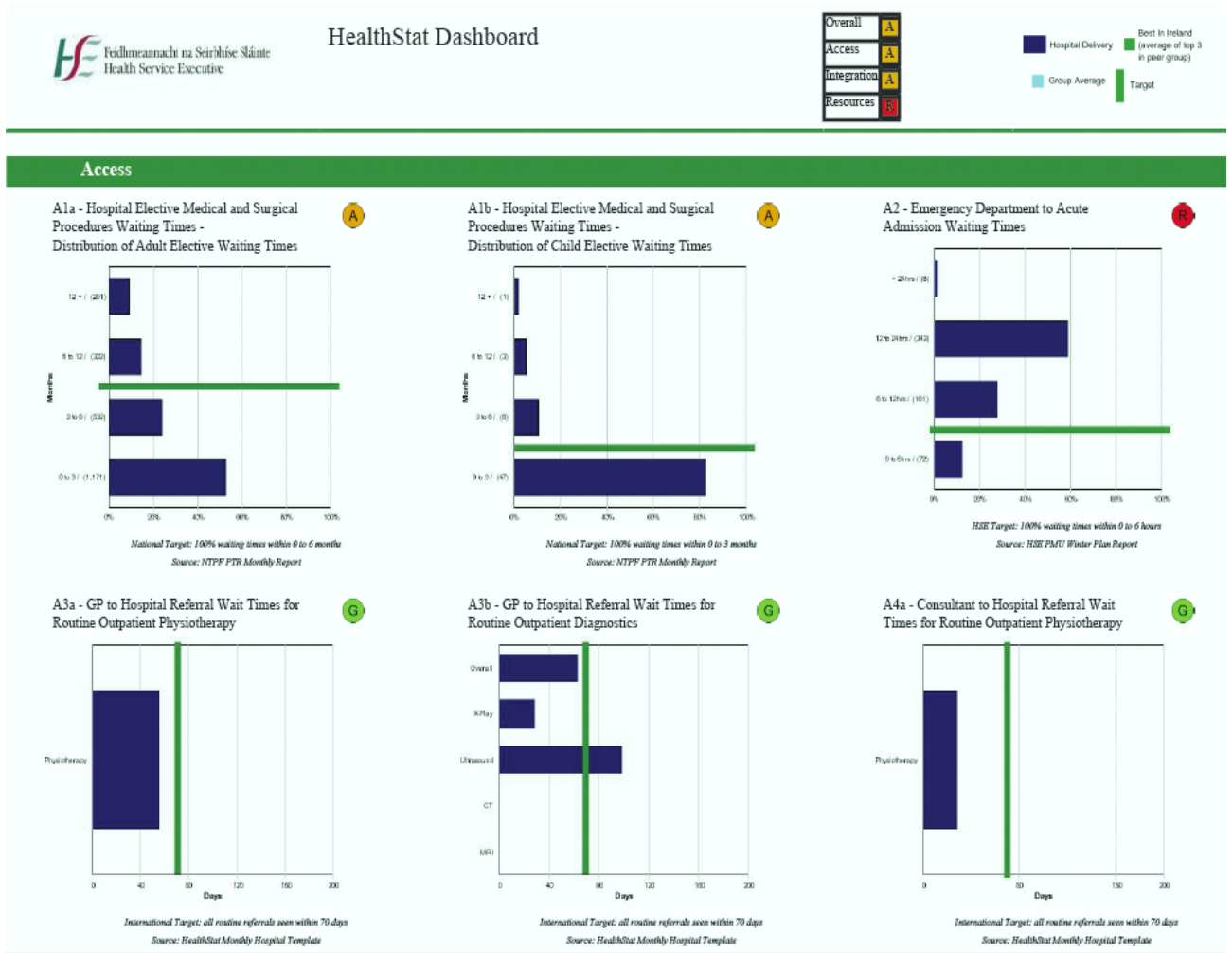
At 2pm the HSE records how long and how many patients have been waiting for admission to a hospital ward from the time they have been referred by the A&E team for admission

	Average no. of people who attend this ED each day	Average no. of people admitted from this ED each day	Number of people who waited following decision to admit (census point at 2pm)				Total
			0 -6	6 - 12	12-24	> 24	
Cavan General Hospital	95	20	0	0	0	0	0
South Tipperary General Hospital	104	16	0	0	0	0	0
Sligo General Hospital	105	21	0	0	0	0	0
Midland Regional Hospital - Portlaoise	112	28	0	0	0	0	0
St. Michaels Hospital DLaoire	46	4	0	0	0	0	0
Wexford General Hospital	110	21	0	0	0	0	0
Nenagh General Hospital	33	6	0	0	0	0	0
St.Johns Hospital - Limerick	51	6	0	0	0	0	0
Our Ladys Hospital - Navan	58	8	0	0	0	0	0
Kerry General Hospital	99	24	0	0	0	0	0
Midland Regional Hospital - Tullamore	82	17	0	0	0	0	0
St. Vincents Hospital Elm Park	122	24	0	0	0	0	0
Mayo General Hospital	93	28	0	0	0	0	0
South Infirmary - Victoria Hospital	66	10	0	0	0	0	0
Ennis General Hospital	44	5	0	0	0	0	0
St Lukes Hospital - Kilkenny	109	26	1	0	0	0	1
Longford/Westmeath Reg'l Hosp Mullingar	104	24	1	0	0	0	1
Louth County Hospital	47	11	2	0	0	0	2
Waterford Regional Hospital	176	45	4	0	0	0	4
Letterkenny General Hospital	94	36	5	0	0	0	5
Naas General Hospital	73	21	3	1	0	0	4
Regional Hospital - Dooradoyle	175	48	4	1	0	0	5
Our Lady of Lourdes	138	26	7	1	0	0	8
St. Columcilles Hospital	57	11	0	5	0	0	5
Portiuncula Hospital Ballinasloe	59	20	0	0	1	0	1
St. James Hospital	128	33	5	1	1	0	7
Roscommon County Hospital	42	13	0	0	4	0	4
Adelaide & Meath Hospital Inc NCH	120	37	2	4	4	0	10
University Hospital Galway	179	47	4	1	5	0	10
Cork University Hospital	162	42	5	3	5	0	13
Connolly Hospital - Blanchardstown	91	20	5	1	7	0	13
Beaumont Hospital	133	31	1	8	17	0	26
Mercy University Hospital	68	14	1	0	2	1	4
Mater Misericordiae Hospital	122	27	1	0	7	4	12
Totals	3297	770	51	26	53	5	135

Appendix 9: Hospitals with EDs

Hospital Name	Daily Census	PET complete data	PET Sampling
AMNCH, Tallaght	Yes	Yes	
Beaumont Hospital, Dublin	Yes	Yes	
Cavan General Hospital	Yes		Yes
Connolly Hospital, Blanchardstown	Yes		Yes
Cork University Hospital	Yes	Yes	
Ennis General Hospital	Yes		
Kerry General Hospital	Yes	Yes	
Letterkenny General Hospital	Yes	Yes	
Limerick Regional Hospital, Dooradoyle	Yes	Yes	
Longford/Westmeath General Hospital	Yes		
Louth County Hospital	Yes		Yes
Mater Misericordiae Hospital	Yes		Yes
Mayo General Hospital	Yes		Yes
Mercy University Hospital, Cork	Yes		Yes
Midland Regional Hospital, Portlaoise	Yes		
Midland Regional Hospital, Tullamore	Yes	Yes	
Naas General Hospital	Yes		Yes
Nenagh General Hospital	Yes		
Our Lady of Lourdes, Drogheda	Yes		Yes
Our Lady's Hospital, Navan	Yes		Yes
Portiuncula Hospital, Ballinasloe	Yes	Yes	
Roscommon County Hospital	Yes		Yes
Sligo General Hospital	Yes		
South Infirmary-Victoria Hospital Cork	Yes		Yes
South Tipperary General Hospital	Yes		Yes
St. Colmcilles Hospital, Loughlinstown	Yes		
St. James Hospital, Dublin	Yes	Yes	
St. John's Hospital, Limerick	Yes		Yes
St. Lukes Hospital, Kilkenny	Yes		Yes
St. Michael's Hospital, Dunlaoghaire	Yes		Yes
St. Vincents Hospital, Elm Park	Yes	Yes	
University Hospital Galway	Yes		Yes
Waterford Regional Hospital	Yes		Yes
Wexford General Hospital	Yes		

Appendix 10: Example of a dashboard (showing theme & overall rating)



Appendix 11: Sample cover letter

John Greaney
Address line 1,
Address line 2,
Address line 3,
Phone: OXX XXXXXXX
E-mail: greanejp@tcd.ie

Name,
Address line 1,
Address line 2,
Address line 3,

8th July 2009

Dear,

I am undertaking an MSc in Health Informatics through Trinity College Dublin. My dissertation involves visiting the Emergency Department of an Irish hospital to carry out an impact assessment of collecting data for Key Performance Indicators. I have attached an information sheet for your reference, which includes details of my dissertation and a definition of the sample performance indicators I propose to use for my dissertation.

I would really appreciate it if I could meet with you within the next two weeks to get some background information. I have obtained agreement from the XXXXXXX of XXXXX at XXXXXXXX Hospital to contact you and request your assistance with my project. The meeting should take no longer than 30 minutes and I will readily cancel or reschedule the visit without hesitation at your request in the event that the meeting conflicts with the needs of the emergency department or your other commitments. I will phone you next week to ascertain if you will agree to meet with me and arrange an appointment suitable to your timetable.

Please do not hesitate to contact me if you require additional information.

Kind regards,

John Greaney

Appendix 12: Information Sheet

There is an ever increasing need to monitor the performance of our healthcare system to ensure it meets the needs of society and to determine if we are getting value for money. Information on the performance of the healthcare system enables organisations to identify areas of high quality and areas in which there is room for improvement. One tool that is frequently used to assist in performance monitoring are performance indicators.

I am undertaking a MSc in Health Informatics through Trinity College Dublin and for my dissertation I propose to examine the challenges of developing Key Performance Indicators (KPIs) to monitor healthcare quality. Firstly I propose to highlight the importance of developing good quality indicators and to assist in this process I have developed a set of generic guidelines for developing key performance indicators. I then propose to carry out an impact assessment to examine the challenges of operationalising indicators in a medium sized Emergency Department (ED) of an Irish hospital.

I have selected two indicators on which to base my study. The first KPI is based on waiting times, measured from when the patient is first registered in the ED through to their eventual discharge, transfer or admission to a bed in the hospital. I have chosen waiting times as it is used in a number of other jurisdictions, facilitates benchmarking and is of significant concern to healthcare staff, patients and the public. I recognise that total time in the ED is not a specific measure of ED performance, as it is dependant on factors external to the department, such as bed availability. It might therefore be considered to be more of a measure of system performance than departmental performance, but is often perceived by the public as representative of ED performance. To counteract this bias I will examine what processes, external to the control of ED staff, contribute to delays in EDs to determine if data that contributes to the explanation for delays can be captured. These additional data will also enable the ED to identify delays caused by factors outside of the department's control and facilitate the separation of system performance from departmental performance.

The second KPI was selected in a Delphi Study carried out by Beattie and Mackway-Jones (2004) in the UK and is widely accepted as being indicative of the quality of ED

care. This is “door to needle time” for thrombolytic therapy in patients diagnosed with acute myocardial infarction. I accept that not all Emergency Departments routinely care for patients with evolving myocardial infarctions but my study involves an impact assessment of data collection rather than an assessment of clinical care.

To assist in developing an insight into the patient journey through the ED from registration to eventual discharge from the ED and to carry out the impact assessment on systems and processes of collecting the data required for the KPIs, I would like to meet with a range of experienced ED staff. These include the following:

- Senior Clinical Decision-maker(s)
- Senior Nurse Managers
- Administrative staff

The meetings should take no more than 30 minutes with each person and the needs of the emergency department will at all times take priority over the needs of my project. You are free to cancel or reschedule the meeting at any time. The purpose of the meetings is to gain an insight into the processes involved in the patient journey from experienced ED staff and to provide background information for my impact assessment.

Topic areas for discussion include:

- Are the data as outlined in the KPI minimum data sets (Attached) currently being captured by the hospital information system?
- What impact, if any, will the collection of information as outlined in the KPI minimum data sets have on systems and processes?
- Is there a need to collect additional local data to support the introduction of national targets?

My dissertation is based on determining the capacity of the information systems to capture data at selected points on the patients journey through the ED from registration to eventual discharge, transfer or admission. This will be done through interview with staff members that have significant knowledge of the information systems and of the patient journey. I do not propose to access or collect any confidential patient, staff or organisational information in the course of my visit to the hospital.

When I have completed the impact assessment I will be happy to meet with you to discuss my findings.

Appendix 13: Consent

INFORMED CONSENT FORM

PROJECT TITLE: *Developing Key Performance Indicators to monitor healthcare quality*

PRINCIPAL INVESTIGATOR: John Greaney

BACKGROUND

There is an increasing need to monitor the performance of our healthcare system to ensure it meets the needs of society and to determine if we are getting value for money. Information on the performance of the healthcare system enables organisations to identify areas of high quality and areas in which there is room for improvement. One tool that is frequently used to assist in performance monitoring are performance indicators.

This project involves carrying out an impact assessment to determine the implications of requesting a medium sized Emergency Department of an Irish hospital to capture information at selected points on the patient's journey through the Emergency Department to eventual discharge, transfer or admission to the hospital. This project involves assessing the impact of collecting data and I do not propose to collect any confidential patient, staff or organisational information in the course of my visit to the hospital.

DECLARATION:

I have read, or had read to me, the information leaflet for this project and I understand the contents. I understand that the data derived from my participation will be used for research purposes and may appear in written documentation of the research but will not be linked to me: my participation will be fully anonymous. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction. I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights. I understand that I may withdraw from the study at any time and I have received a copy of this agreement. I understand that I may request information about the outcome of this study after its completion.

PARTICIPANT'S NAME:

PARTICIPANT'S SIGNATURE: **Date:**.....

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

INVESTIGATOR'S SIGNATURE:..... Date:.....

(Keep the original of this form in the investigator's file, give one copy to the participant, and send one copy to the sponsor (if there is a sponsor).

Appendix 14: Abbreviations

ACHS	Australian Council on Healthcare Standards
ANP	Advanced Nurse Practitioner
COPD	Chronic Obstructive Pulmonary Disease
CIHI	Canadian Institute for Health Information
DoHC	Department of Health and Children
ED	Emergency Department
HCQI	Health Care Quality Indicator project
HIS	Hospital Information System
HSE	Health Service Executive
ICD	International Classification of Diseases
IHSAB	Irish Health Services Accreditation Board
ISO	International Standards Organisation
IT	Information Technology
JCAHO	Joint Commission for Accreditation of Healthcare Organisations
KPI	Key Performance Indicator
LIS	Laboratory Information System
MDS	Minimum Data Set
MRN	Medical Record Number
NHS	National Health Service
NIP	National Indicator Project
NSP	National Service Plan
OECD	Organisation for Economic Cooperation and Development
OPD	Out Patients Department

PAS	Patient Administration System
PCCC	Primary Community and Continuing Care
PCI	Percutaneous Coronary Intervention
PTCA	Percutaneous Coronary Transluminal Angioplasty
PMR	Performance Monitoring Report
PMU	Performance Management Unit
RIS	Radiology Information System
SNOMED	Systematised Nomenclature of Medicine – Clinical Terms

Appendix 15: Glossary of terms

Glossary

Balanced scorecard: A framework developed by Robert Kaplan and David Norton that suggests four perspectives of performance measurement to provide a comprehensive view of an organisation.

Benchmarking: The process of comparing the cost, cycle time, productivity, or quality of a specific process or method to another that is widely considered to be an industry standard or best practice.

Data Dictionary: A database used for data that refers to the use and structure of other data; that is, a database for the storage of metadata [ANSI X3.172- 1990].

Data element: A unit of data for which the definition, identification, representation, and permissible values are specified by means of a set of attributes.

Delphi technique: A method for obtaining group consensus involving the use of a series of mailed questionnaires and controlled feedback to respondents which continues until consensus is reached

Denominator: The specifications that describe the sampling, inclusion and exclusion criteria that determine the eligibility of data for a measure.

Metadata: Data that defines and describes other data

Minimum Data Set: The minimum categories of data with uniform definitions and categories, concerning a specific aspect or dimension of the health care system which meets the basic needs of multiple data users.

Myocardial Infarction: An occlusion or blockage of the arteries supplying the heart muscle resulting in damage or necrosis to the heart muscle.

Numerator: The specifications that define the subset of data items in the denominator that meet the indicator criteria.

Object Class: A set of ideas, abstractions, or things in the real world that can be identified with explicit boundaries and meaning and whose properties and behavior follow the same rules.

Performance Indicators: Performance Indicators are specific and measurable elements of practice that can be used to assess quality of care. Indicators are quantitative measures of structures, process or outcomes that may be correlated with quality of care delivered by the healthcare system.

Primary PCI: Primary PCI is the use of a balloon catheter to widen narrowed coronary arteries during the acute phase of myocardial infarction.

Process indicators: The attributes of the health system that contribute to its ability to meet the healthcare needs of the population and measure the activities carried out in the diagnosis and treatment of patients.

Reliability: Reliability is the consistency of your measurement, or the degree to which an instrument measures the same way each time it is used under the same condition with the same subjects.

Structure indicators: The attributes of the health system that contribute to its ability to meet the healthcare needs of the population.

Thrombolysis: Thrombolysis is the breakdown of clots using intravenous drug therapy for the purpose of unblocking arteries.

Validity: The best available approximation to the truth or falsity of a given inference, proposition or conclusion.