



**Health
Information
and Quality
Authority**

An tÚdarás Um Fhaisnéis
agus Cáilíocht Sláinte

Guidance on Developing Key Performance Indicators and Minimum Data Sets to Monitor Healthcare Quality

February 2013

Version 1.1

Safer Better Care

About the Health Information and Quality Authority

The Health Information and Quality Authority is the independent Authority which has been established to drive continuous improvement in Ireland's health and social care services. The Authority was established as part of the Government's overall Health Service Reform Programme.

The Authority's mandate extends across the quality and safety of the public, private (within its social care function) and voluntary sectors. Reporting directly to the Minister for Health and Children, the Health Information and Quality Authority has statutory responsibility for:

Setting Standards for Health and Social Services — Developing person centred standards, based on evidence and best international practice, for health and social care services in Ireland (except mental health services)

Social Services Inspectorate — Registration and inspection of residential homes for children, older people and people with disabilities. Inspecting children detention schools and foster care services. Monitoring day and pre-school facilities.¹

Monitoring Healthcare Quality — Monitoring standards of quality and safety in our health services and implementing continuous quality assurance programmes to promote improvements in quality and safety standards in health. As deemed necessary, undertaking investigations into suspected serious service failure in healthcare

Health Technology Assessment — Ensuring the best outcome for the service user by evaluating the clinical and economic effectiveness of drugs, equipment, diagnostic techniques and health promotion activities

Health Information — Advising on the collection and sharing of information across the services, evaluating information and publishing information about the delivery and performance of Ireland's health and social care services

¹ Not all parts of the relevant legislation, the Health Act 2007, have been commenced. Those parts that apply to children's services are likely to be commenced in 2010.

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Revision history

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Version 1, September 2010		Guidance on Developing Key Performance Indicators and Minimum Data Sets to Monitor Healthcare Quality	
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Executive Summary

The primary mandate of the Health Information and Quality Authority (the Authority) is to drive patient safety in health and social care in Ireland. A key component of this work relates to effectively monitoring the performance of healthcare services. Key performance indicators (KPIs) are an essential tool in this process as they enable the public, service users and healthcare providers alike to have reliable information on current and desired standards in healthcare services. KPIs are used to identify where performance is good and meeting desired standards, and where performance requires improvement.

KPIs promote accountability to service users by facilitating comparisons with other organisations and to stated objectives or targets of an organisation. Further, they promote accountability to central Government for the efficient use of resources with other comparable organisations

Reflecting an increased awareness of the importance of quality and safety in healthcare, quality assessment has become increasingly critical - unless we actually measure the quality and safety of care, we cannot determine if improvements are being made. This is one of the key ways in which key performance indicators can have a positive impact for patients and service users.

Performance monitoring is a continuous process that involves collecting data to determine if a service is meeting desired standards or targets. It is dependent on good quality information on health and social care which 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 and which can subsequently contribute to performance improvement in quality and safety, is the development and monitoring of key performance indicators (KPIs).

KPIs, which are specific and measurable elements of health and social care, can be used to assess the quality of care. They are measures of performance, based on standards determined through evidence-based academic literature or through the consensus of experts when evidence is unavailable.

The purpose of this document is to provide guidance for the development of KPIs and associated minimum data sets (MDSs) to monitor healthcare quality. Minimum data sets refer to the minimum amount of information required for the purpose of monitoring quality and safety through KPIs.

The guidance outlined in this document is based on an analysis of evidence from an extensive literature review. It is intended as a resource for all stakeholders, including the public and service users, but more specifically, policy makers and frontline

practitioners, with responsibility for the development and implementation of KPIs and associated MDSs.

Part 1 of this document provides an overview of relevant literature and outlines the importance of performance monitoring in contributing to the safety and quality of health and social care. It introduces key performance indicators (KPIs) and their role in performance monitoring, including benefits and risks.

Part 2 of this document examines best practice and provides specific guidance on the development of KPIs and minimum data sets (MDSs). It identifies important factors that should be taken into consideration when developing and evaluating KPIs for performance monitoring.

Part 1:

Overview of performance monitoring

1 Introduction

1.1 Overview of the Health Information function

Health is information-intensive, generating huge volumes of data every day. It is estimated that up to 30% of the total health budget may be spent one way or another on handling information, collecting it, looking for it, storing it. It is therefore imperative that information is managed in the most effective way possible in order to ensure a high quality, safe service.

Safe, reliable, healthcare depends on access to, and the use of, information that is accurate, valid, reliable, timely, relevant, legible and complete. For example, when giving a patient a drug, a nurse needs to be sure that they are administering the appropriate dose of the correct drug to the right patient and that the patient is not allergic to it. Similarly, lack of up-to-date information can lead to the unnecessary duplication of tests – if critical diagnostic results are missing or overlooked, tests have to be repeated unnecessarily and, at best, appropriate treatment is delayed or at worst not given.

In addition, health information has a key role to play in healthcare planning decisions - where to locate a new service, whether or not to introduce a new national screening programme and decisions on best value for money in health and social care provision.

The Health Information and Quality Authority was established under the Health Act, 2007 with the primary objective of promoting safety and quality in the provision of health and personal social services for the benefit of the health and welfare of the public.

Under section (8) (1) (k) the Health Act, 2007 the Authority has responsibility for setting standards for all aspects of health information and monitoring compliance with those standards. In addition, under section 8 (1) (j) the Authority is charged with evaluating the quality of the information available on health and social care and making recommendations in relation to improving the quality and filling in gaps where information is needed but is not currently available.

Information and Communications Technology (ICT) has a critical role to play in ensuring that information to drive quality and safety in health and social care settings is available when and where it is required. For example, it can generate alerts in the event that a patient is prescribed medication to which they are allergic. Further to this, it can support a much faster, more reliable and safer referral system between the patient's general practitioner (GP) and hospitals.

Although there are a number of examples of good practice, the current ICT infrastructure in Ireland's health and social care sector, is highly fragmented with major

gaps and silos of information which prevents the safe, effective, transfer of information. This results in service users being asked to provide the same information on multiple occasions.

Information can be lost, documentation is poor, and there is over-reliance on memory. Equally, those responsible for planning our services experience great difficulty in bringing together information in order to make informed decisions. Variability in practice leads to variability in outcomes and cost of care. Furthermore, we are all being encouraged to take more responsibility for our own health and well-being, yet it can be very difficult to find consistent, understandable and trustworthy information on which to base our decisions.

As a result of these deficiencies, there is a clear and pressing need to develop a coherent and integrated approach to health information, based on standards and international best practice. A robust health information environment will allow all stakeholders – the general public, patients and service users, health professionals and policy makers – to make choices or decisions based on the best available information. This is a fundamental requirement for a high reliability healthcare system.

Through its health information function, the Authority is addressing these issues and working to ensure that high quality health and social care information is available to support the delivery, planning and monitoring of services. One of the areas currently being addressed through this work programme is the need to provide guidance on the development of key performance indicators (KPIs).

1.2 Background

Information plays a pivotal role in promoting improvements in the safety and quality of patient care. Performance measurement promotes accountability to all stakeholders including the public, service users, clinicians and the Government by facilitating informed decision-making and safe, high quality and reliable care through monitoring, analysing and communicating the degree to which healthcare organisations meet key goals⁽¹⁾. Accurate performance measurement is dependent on information that is of good quality, comparable and can be shared within the health sector.

KPIs play an important role in the performance measurement process by helping to identify and appropriately measure levels of service performance. The *National Standards for Safer Better Healthcare*^{*} recognise the use of performance indicators as part of the process to systematically monitor, evaluate and continuously improve the quality of care.

^{*} Health Information and Quality Authority. *National Standards for Safer Better Healthcare*: June 2012. Dublin: Health Information and Quality Authority; 2012.

In and of themselves, KPIs cannot improve quality, however, they effectively act as flags or alerts to identify good practice, provide comparability within and between similar services, where there are opportunities for improvement and where a more detailed investigation of standards is warranted. The ultimate goal of KPIs is to contribute to the provision of a high quality, safe and effective service that meets the needs of service users. The Authority published a report on Pre-hospital Emergency Care Key Performance Indicators for Emergency Response Times^{**} which made recommendations to the Minister for Health on the introduction of key performance indicators for national pre-hospital emergency care response times.

Data used to support KPIs should be standardised, with uniform definitions, to ensure that it is collected consistently and that it supports the measurement process, facilitating meaningful comparison. This can be achieved through the development of a minimum data set (MDS) containing a list of standardised data to support performance measurement with KPIs.

The purpose of this document is to provide guidance for the development of KPIs and associated MDSs to monitor healthcare quality. The guidance is based on an analysis of the evidence from an extensive literature review and is intended to be a resource for stakeholders in the development of KPIs and MDSs.

1.3 The role of KPIs

Healthcare providers are constantly striving to improve the quality and safety of the care they provide, and service users are becoming increasingly interested in the quality of care provided by various organisations and individuals. A seminal report published by the United States (US) Institute of Medicine, *To Err is Human*⁽²⁾ identified deficiencies in the quality and safety of healthcare in the US and led towards the worldwide realisation that there was an urgent need to monitor the quality and safety of the care provided and increase efforts at improvement.

There are three distinct drivers that can encourage organisations to improve the quality and safety of the care they provide - professionalism, regulation and market forces⁽³⁾. With regard to professionalism, members of a profession establish and maintain standards for its membership through a system of governance. In regulation, the government and independent regulators such as the Authority, establish standards to which everyone must comply resulting in an overall increase in the quality of services. Finally, through market forces, consumers influence improvement in quality and safety by selecting those organisations that have desirable quality and safety records.

^{**} Health Information and Quality Authority. *Pre-hospital Emergency Care Key Performance Indicators for Emergency Response Times: October 2010 (Version 1.1)*. Dublin: Health Information and Quality Authority; 2012.

Assessing the quality and safety of care has become increasingly important because, unless we actually measure the quality and safety of care, we cannot determine if improvements are being made⁽⁴⁾. Although it is a contributing factor, the measurement of quality alone does not lead to improved performance⁽³⁾. However, performance measurement contributes to improving quality in a number of ways⁽⁵⁾. Firstly, it drives improvement by enabling service users to make choices based on quality measures, which in turn creates an incentive for providers to improve performance so as to attract more service users.

Secondly, professionals have an intrinsic desire to improve performance when they are made aware, through performance measurement, that there is potential for improvement.

Finally, performance measurement drives improvement through comparing the performance of individuals, teams or organisations resulting in a desire to improve or maintain performance relative to others and the reliability of the quality and safety of services that they provide.

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 is essential to determine what aspects need to be measured.

Performance monitoring is dependent on good quality information which 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 and which can subsequently contribute to performance improvement is 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 that the data collected is of high quality (that is, consistent, reliable and in keeping with shared definitions) and to enhance their validity and reliability. Valid KPIs measure what they are intended to measure and reliable KPIs will consistently produce the same result regardless of who performs the measurement.

Using KPIs can lead to improvements in quality and safety when they are used for learning at organisational level, facilitating improvements in local service delivery rather than solely being used as a tool to evaluate providers⁽⁶⁾ at a national, system, level. Using performance indicators at a local level assists organisations develop an insight into safe and effective care processes.

This guidance has been developed to assist individuals and organisations identify develop or select KPIs and associated minimum data sets for the purpose of monitoring quality and safety in health and social care.

The delivery of health and social care is dependent on both clinical and administrative staff, with a variety of information needs. This guidance is intended as a resource for all staff and identifies important factors to be considered in order to deliver a balanced suite of good quality KPIs.

2 Quality

Quality involves meeting and exceeding an acceptable level of performance through the provision of a safe and effective service. It is a broad and complex concept which is neither simple to define nor measure but is nonetheless central to effective, modern, healthcare services. For this reason, improving quality has become an integral component of effective healthcare delivery and is mandatory in some countries where there are obligations to comply with standards for healthcare.

In healthcare, concerns about quality usually revolve around the ability of organisations to achieve desired outcomes using processes that have been demonstrated to achieve those outcomes⁽⁷⁾. Even though quality can be improved without measuring it, for example through the use of clinical practice guidelines and specialist education, it is only through measurement that we can be sure that improvements are being made. Measurement is therefore critically important both in identifying where quality and safety is compromised and in monitoring quality improvement processes.

2.1 Structure/Process/Outcome

One of the most significant developments in relation to performance monitoring in the last 30 years has been Avedis Donabedian's⁽⁸⁾ division of healthcare into structure, process and outcome, for the purpose of defining and measuring quality. Donabedian has contributed significantly to improvements in the quality and safety of health and social care through his lifelong commitment to the use of performance measures. According to Donabedian⁽⁹⁾, healthcare quality can be assessed using a three-part model based on the structures, processes and outcomes of the healthcare system. This division of healthcare has allowed the identification of data across the full spectrum of healthcare that contributes to monitoring the quality of the various constituents of healthcare delivery.

- **Structure** relates to the resources of the healthcare system that contribute to its ability to meet the healthcare needs of the population. Structural indicators refer to the resources used by an organisation to deliver healthcare and include buildings, equipment, the availability of specialist personnel and available finances.
- **Process** relates to what is actually done for the service user and how well it is done. Process indicators measure the activities carried out in the assessment and treatment of service users and are often used to measure compliance with recommended 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 include lifestyle improvements, emotional responses to illness or its care, alterations in levels of pain, morbidity and mortality rates, and increased level of knowledge⁽¹⁰⁾.

Donabedian also stated that each part of the model is interdependent and that good structures promote good processes and, in turn, good processes promote good outcomes. The healthcare quality measurement process can be assisted through the use of KPIs to capture a variety of selected factors and trends of both health and the healthcare system⁽¹¹⁾.

2.2 Quality improvement

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

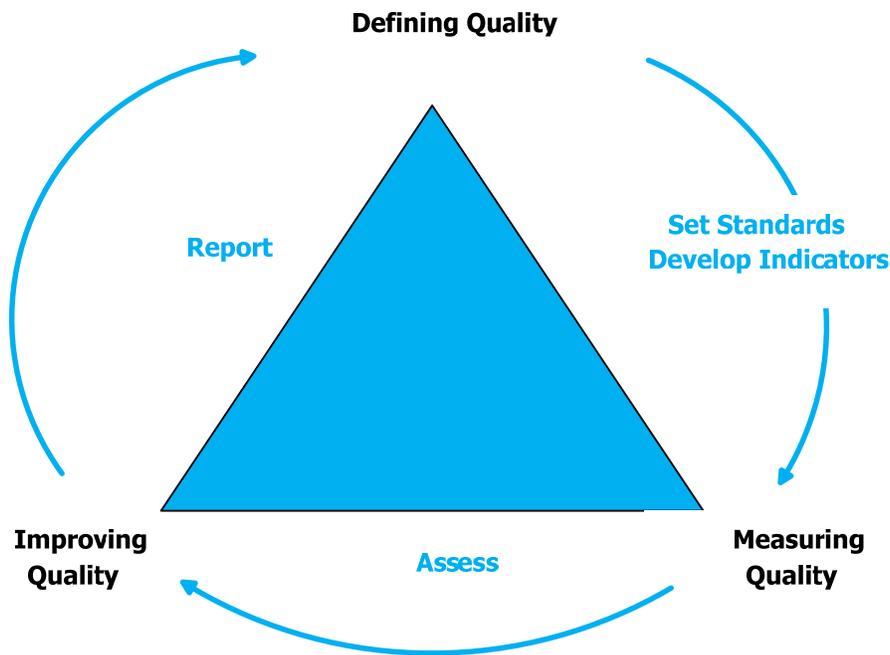


Figure 1: Quality Assurance Triangle⁽¹²⁾

2.2.1 Defining quality

Defining quality involves setting and following standards for an acceptable level of performance. According to Øvretveit:⁽¹³⁾

“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”.

In other words, a quality healthcare service provides care based on the assessed needs of the population, using finite resources efficiently to attain optimum outcomes and minimise the risks associated with healthcare delivery.

According to Donabedian⁽⁸⁾ healthcare quality is the combination of “the science and technology of healthcare 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.

The most common and most widely accepted definition for quality in healthcare has been proposed by the US Institute of Medicine⁽¹⁴⁾ as:

“the degree to which services for individuals and populations increase the likelihood of desired outcomes and are consistent with current professional knowledge”.

McGlynn⁽¹⁵⁾ 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 research.

The variety of definitions of quality found in the literature reaffirms the view that quality is a complex concept and also highlights the importance of having a shared understanding of quality prior to commencing the process of monitoring.

2.2.2 Monitoring quality

As a result of the complexity of quality, monitoring quality can pose many challenges. Monitoring quality involves evaluating current performance, including service-user perspectives, against a standard or expected level of performance. This consists of defining indicators, developing information systems and the analysis and evaluation of results⁽¹²⁾.

It is important that we are clear on the reasons for monitoring and that we are not monitoring merely for the sake of it. The main reason for monitoring health and social care quality is to identify opportunities to improve performance where it has been highlighted that performance is not at the desired standard⁽⁸⁾. Sub-standard performance in the delivery of health and social care compromises the safety of service users and contributes to undesirable outcomes.

The ability to monitor and report on quality is accepted as a basis for the improvement in the delivery of healthcare. Monitoring and reporting on quality assists healthcare providers improve performance through benchmarking, empowers consumers to make

informed decisions and facilitates system-wide quality improvement by informing national policies^(16;17). KPIs can be used for monitoring and reporting on performance through benchmarking, to 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 and 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⁽¹²⁾ in performance.

2.3 Domains of quality

In order to effectively monitor healthcare quality and safety, it is essential that we clearly define and agree those aspects of healthcare delivery that should be measured.

The Organisation for Economic Cooperation and Development (OECD) is an inter-governmental 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 further develop on previous work to identify quality indicators for international comparison and to set priority areas for additional KPI development.

The OECD HCQI project has identified the most common domains of healthcare quality assessed in a number of countries including Australia, Denmark, Canada, Netherlands, United States and United Kingdom⁽¹⁸⁾. According to Arah et al⁽¹⁹⁾, domains of healthcare quality are:

“... those definable, preferably measurable and actionable, attributes of the system that are related to its functioning to maintain, restore or improve health.

A review of the literature and evidence has identified five key domains that can be used to describe healthcare quality:

- **Safe:** the service protects the health and welfare of service users; it minimises the risk associated with delivering care; it prevents adverse events, minimises their impact when they occur and learns when things go wrong
- **Effective:** care that delivers the best achievable outcomes through the evaluation and use of available evidence
- **Person-centred:** care that centres on the needs and rights of service users, respects their values and preferences and actively involves them in the provision of their care

- **Equitable:** the service enables fair access to care which is delivered based on need. It also addresses identified health inequalities of the population served
- **Efficient:** the service manages and develops its available resources sustainably to deliver and maintain the best possible quality of care.

2.4 Conceptual frameworks

Research indicates that the health status of individuals and populations is the result of a combination of factors and is not solely dependent on access to and the use of healthcare services but it is influenced by factors such as genetics, environment, education, income and interpersonal relationships.

The “determinants of health” model⁽²⁰⁾ recognises that while people have control over some factors that influence their health status, other factors are outside of their control. Similarly, the quality of health services can impact on the health status of individuals and populations, but there are additional factors that contribute to health that are beyond the scope of the health service. A determinants of health model incorporates⁽²⁰⁾:

- income and socioeconomic status – higher income and social class are associated with better health
- education – lower levels of education are associated with poorer health
- environment – pollution, working environments, accommodation all contribute to health status
- employment – unemployment is associated with poorer health status
- genetics – some people are more likely to develop illness based on their family history
- personal behaviour – people can influence their health status by food choices, physical activity levels, alcohol/drug consumption and smoking status
- gender – men and women are prone to developing different illnesses
- health services – access to and use of health services can influence the prevention and treatment of illness.

The OECD HCQI project has developed a conceptual framework (see Appendix 1) to recognise that health is determined by a number of interdependent factors, one of which is healthcare. A conceptual framework provides a structure to guide the process of developing KPIs. The OECD framework consists of four interconnected levels representing⁽¹⁹⁾:

- health – to capture the health status of the population
- non-healthcare determinants of health – to capture non-healthcare factors that influence health
- healthcare system performance – to capture the performance of the healthcare system

- health system design and context – to capture contextual information regarding individual countries.

Healthcare systems should develop a structure for performance measurement within which individual performance measures can be identified and developed⁽¹⁹⁾. A conceptual framework can incorporate the domains of healthcare such as safety and person-centred care that have been identified by individual healthcare systems. It is also sufficiently broad to incorporate all the factors that influence healthcare outcomes including healthcare system performance. It facilitates the development of performance measures that can be used for comparison internationally while taking into account the non-healthcare determinants of health relevant to individual countries.

2.5 Methods of monitoring and improving quality

Monitoring performance is a key element of quality improvement. The activity of monitoring assists organisations to benchmark performance against identified targets or expectations in order to identify where there is room for improvement. There are a number of methods through which the performance and quality of healthcare organisations can be monitored and improved and in practice monitoring is often a combination of methods, including⁽²¹⁾:

- regulatory inspection
- surveys of consumer experiences
- third-party assessments
- key performance indicators.

2.5.1 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”⁽²²⁾. The standards against which organisations are inspected are often based on minimum legal requirements to safely care for service users.

2.5.2 Surveys of consumer experiences

As healthcare delivery increasingly focuses on empowering service users through health education and increasing their understanding and awareness of the expected level of performance of healthcare services, consumer surveys are increasingly being used as a means of assessment. The benefits of this approach are that it monitors performance from the service-user perspective and identifies what is valued by service users⁽²¹⁾.

2.5.3 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 alone and usually involves measuring aspects of the organisation, such as laboratory systems.

Peer review is a form of professional self-assessment, usually done for the purpose of gaining 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 KPIs. Accreditation is usually done for the purpose of organisational development rather than regulation⁽²¹⁾.

2.5.4 Key Performance Indicators

KPIs are specific and measurable elements of health and social care that can be used to assess quality of care⁽²³⁾. KPIs 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 United States, KPIs are not intended to be direct measures of quality but instead act as alerts to warn us of opportunities for improvement in the process and outcome of service-user care⁽²⁴⁾.

3 Key performance indicators for healthcare quality assessment

The recognition that there are variations in the quality of healthcare delivered, combined with concerns about the costs of poor quality healthcare has driven the need for the measurement and evaluation of healthcare⁽²⁵⁾. Together with quality improvement, measurement contributes to learning, regulation and accountability and assists healthcare staff in their quest to provide optimal care⁽²⁶⁾.

The ability to monitor healthcare quality is essential in order to effectively measure performance which can be done with the assistance of KPIs⁽¹¹⁾. KPIs 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 require further investigation⁽²⁷⁾.

3.1 Types of indicators

KPIs can be characterised according to whether they are generic or specific and by both the type and function of care for which the measurement is intended (see Figure 2).

3.1.1 Generic or specific KPIs

KPIs can be targeted to measure performance that is relevant to all service-users or they can measure aspects of a service that are relevant to a specific service user population:

- generic KPIs measure aspects of performance relevant to the majority of service users and do not target a specific service user population. For example, the number of service users awaiting admission from the emergency department for more than six hours
- specific KPIs are related to a specific service user population and measure particular aspects of care related to those service users. For example, the percentage of children that have been referred for speech and language therapy that wait more than three months from referral to assessment.

3.1.2 Type of care

KPIs can be classified according to the type of care for which the measurement process was developed. For example, preventive, acute or chronic care. Preventive care refers to the maintenance of health and prevention of illness such as in immunisation programmes. Acute care usually refers to care given for a new onset illness or for a sudden deterioration in chronic conditions and may involve short term medical care or surgery. Chronic care usually refers to the long term care of chronic diseases or conditions such as maintaining acceptable blood glucose levels and prevention of complications in diabetes through medication and lifestyle.

3.1.3 Function of care

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

Figure 2 outlines the many pathways that can be considered when choosing a KPI and demonstrates that the final indicator can be a combination of different classifications of indicators.

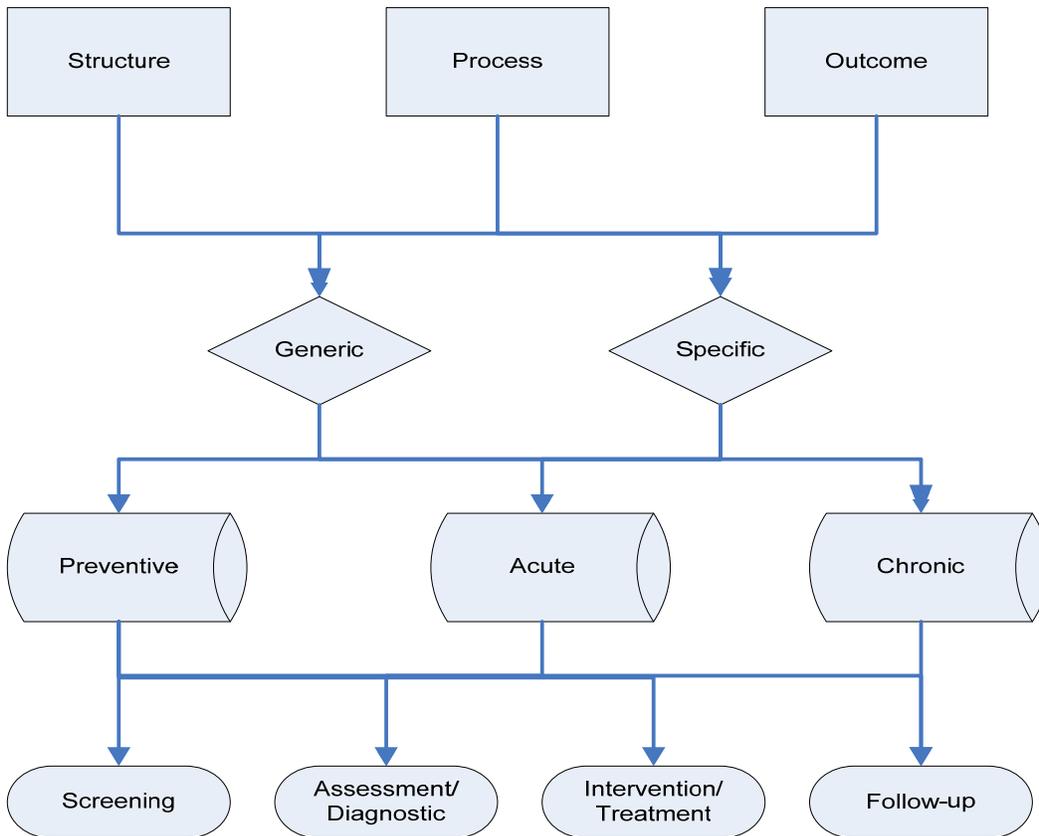


Figure 2: Types of KPIs

To illustrate, Figure 3 outlines two indicators. The first KPI measures the percentage of women between the ages of 25 to 60 that have a cervical screening test result within the last five years. It is a process KPI, it is specific to a particular service user population, it is preventive and is done for the purpose of screening.

The second KPI measures the number of service users that return to the emergency department for an unscheduled visit within seven days with the same condition. It is an outcome KPI, it is generic as it is applicable to all service users, the type of care is acute and the function of care is intervention/treatment.

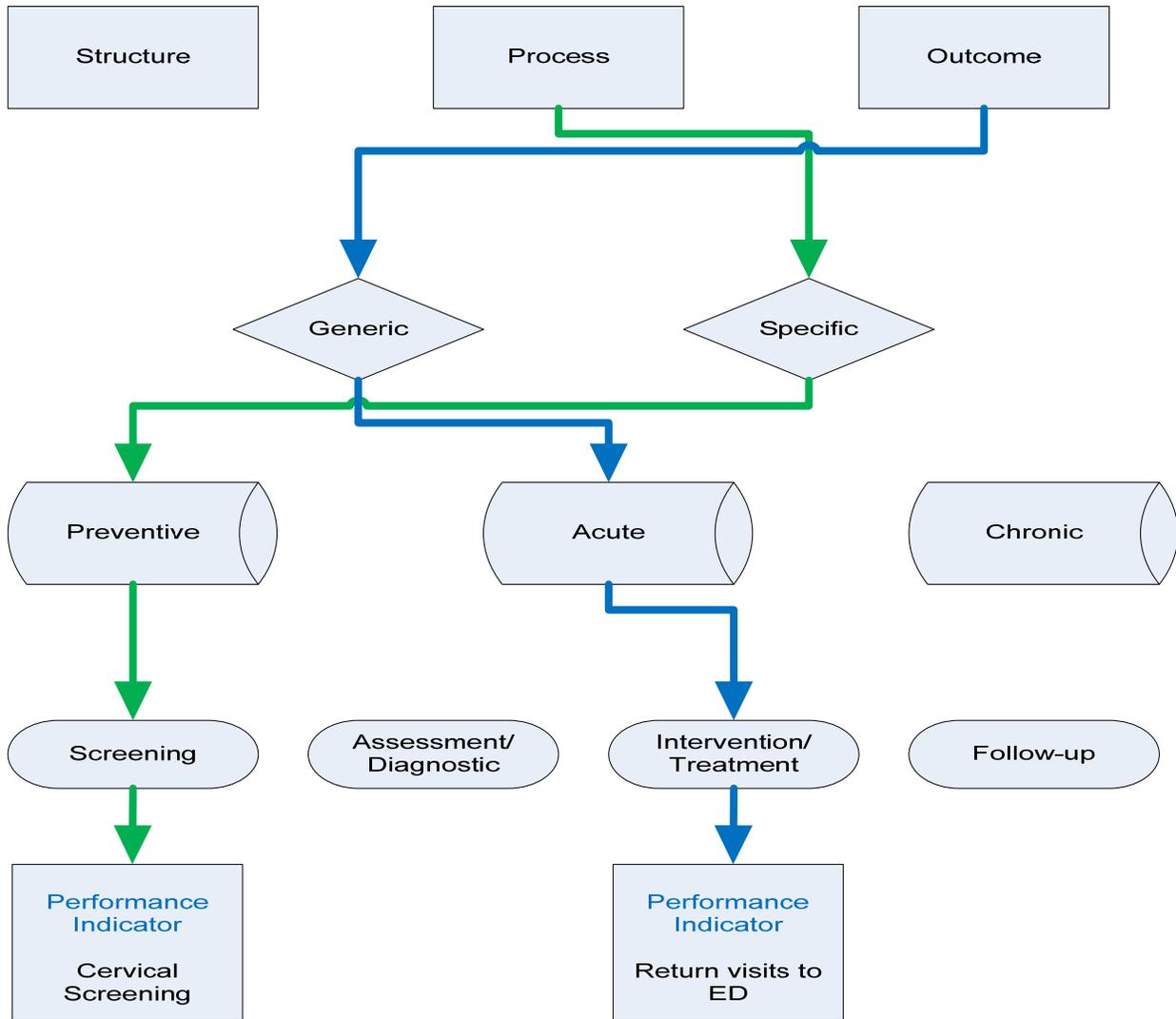


Figure 3: Examples of types of KPIs

3.2 Benefits

Since the measurement of performance itself contributes to improvement, it is necessary to monitor performance in order to improve the quality and safety of healthcare delivery.

3.2.1 Benchmarking

KPIs facilitate the improvement of performance through benchmarking, which makes it possible for organisations to document the quality of care they provide against that

provided by similar organisations. KPIs also facilitate benchmarking within an organisation to highlight improvements in quality and safety over time. These benchmark processes help to identify where there are opportunities for improvement or where improvements have already occurred as a result of changes in the way care is delivered.

3.2.2 Accountability

Through the further process of performance reporting, KPIs promote accountability to all stakeholders. They promote accountability to service users by facilitating comparisons with other organisations and to stated objectives or targets of an organisation. They promote accountability to central government for the efficient use of resources with other comparable organisations.

3.2.3 Service user choice

KPIs support service-users in their choice of providers by making performance results available to them to facilitate comparisons. It is important for healthcare providers to recognise that, although KPIs have the potential to identify variations in service quality, they cannot provide information on why this variation exists⁽²⁸⁾. KPIs are intended to be flags or signals to alert us about the level of performance and that further investigation may be warranted.

3.2.4 Public reporting

A recent study in the United Kingdom indicates that the death rate for patients undergoing coronary artery bypass graft (CABG) surgery declined following the introduction of performance reporting with no evidence to suggest that surgeons were avoiding high-risk patients to improve performance results⁽²⁹⁾. It had been suggested that performance reporting can lead to healthcare providers' avoidance of providing treatment to service users with complicated high-risk conditions⁽³⁰⁾. This latest United Kingdom study supports the view that public reporting of performance does not adversely affect the chances of high-risk patients undergoing elective surgical procedures.

3.2.5 Identify areas for further investigation

In the United Kingdom in 2007, the Healthcare Commission became aware of high mortality rates in the Mid-Staffordshire Trust in comparison with other Trusts⁽³¹⁾. On further investigation, the Commission were able to determine the reasons behind the high level of mortality, which included under-staffing, poor equipment in the emergency department (ED), lack of training for staff, and poor patient care.

The investigation occurred because a key performance indicator measuring mortality had flagged that this was an issue and further supports the positive use of KPIs to flag or alert that performance is not at the desired standard.

3.3 Considerations

KPIs represent a standard method of performance monitoring, but there are a number of risks associated with their use which warrant consideration when KPIs are being decided upon, and in advance of implementation.

In order to maximise the positive impact of performance measurement, the set of KPIs used must provide a comprehensive view of the service without placing an excessive burden on organisations to collect data. A suite of KPIs that reflects the service-user experience or care pathway from primary and community care, including social services, through to secondary care and subsequent follow-up is one method to counteract the temptation for healthcare providers to focus on one particular aspect of care to the detriment of others. The use of a single KPI, or even the use of a limited set of KPIs, may not provide sufficient information for measuring performance and may instead 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⁽²⁸⁾.

3.3.1 Data quality

The KPI needs to be interpreted on the basis of the quality of the data and the definitions that constitute the KPI. 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, making benchmarking impossible. This can be overcome by ensuring that there are explicit definitions for each KPI and built in data quality checks to verify that the required data is accurate.

3.3.2 Service-user profile

Casemix is an internationally recognised system of measuring clinical activity incorporating the age, gender and health status of the population served by an organisation and allows for a fair comparison between organisations.

Not all organisations have an equivalent service-user profile and therefore, Casemix may need to be incorporated into the performance indicator to account for variations that may be demonstrated by presenting raw data. Variations in the service-user profile 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 so it is important that the KPI used appropriately measures outcomes that are attributable to the performance of the healthcare system in which they are employed⁽³²⁾.

3.3.3 Data availability

The decision to select or develop a KPI based solely on available data is another factor which must be considered. Basing KPIs on what the organisation considers an intrinsic component of a quality service will lead to measurements that enhance quality within the organisation. In contrast, basing KPIs on available data, while more expedient, 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.

3.3.4 Local application of KPIs

National targets may allow services to be benchmarked against international comparators, but they provide little information as to why there are variations in results⁽³³⁾. As a result, national KPIs need to be supported by local operational KPIs to provide information at a local level to inform practice.

Performance data, captured at the point of care delivery, can be used locally to involve and inform clinicians in performance improvement. In order to be effective and not overburden an organisation's available resources, healthcare performance data needs to be relevant to the healthcare provider and must not divert resources from the primary purpose of providing frontline healthcare. In the United Kingdom the Healthcare Commission developed the "Better Metrics" project⁽³⁴⁾ in response to the recognition that clinicians were not always aware of targets being used in performance measurement. This project aims to develop metrics that are relevant to clinicians' day-to-day practice and to assist local services in developing their own metrics.

Part 2:

Development of Key Performance Indicators and Minimum Data Sets

4 Development of KPIs

A number of factors, outlined below, should be considered when developing and evaluating KPIs (Figure 4)⁽³³⁻³⁵⁾.

These factors are not presented as a series of steps and even though some may follow a logical order, others can happen at any stage in the process or throughout the whole process. These factors have been identified through a synthesis and analysis of literature following an extensive review and should be considered when developing KPIs.

4.1 Define the audience and use for measurement

It is important to define the goals of the measurement, reasons for measurement and the intended audience in order to identify and develop a suitable KPI.

It is essential to note that whether the goal of the measurement is for benchmarking, either internally for quality improvement purposes or externally against standards or other organisations, will influence the KPI selection process. For example, if the KPI is being developed for the purpose of benchmarking performance internationally, then a KPI must be selected that is widely used internationally and has a clear definition.

There are many quality domains such as safety, effectiveness, efficiency, person centredness and equity. Before embarking on the performance measurement process, it is necessary to identify the domains for which the measurement is intended, which may in turn be dependent on the audience. In order to fully evaluate quality it will be necessary to identify a balanced suite of KPIs.

The intended audience can influence the unit of analysis or the way in which the result is presented. The audience refers to the person or group for whom the KPI will aid decision-making and can be the service-user, 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.

4.2 Consult with stakeholders and advisory group

There should be consultation with all stakeholders throughout the data development process. Consultation facilitates the identification of the needs of stakeholders while simultaneously contributes to the acceptance of the selected KPIs. Consultation also facilitates agreement about data elements and assists in familiarisation with the data and standards⁽³⁵⁾.

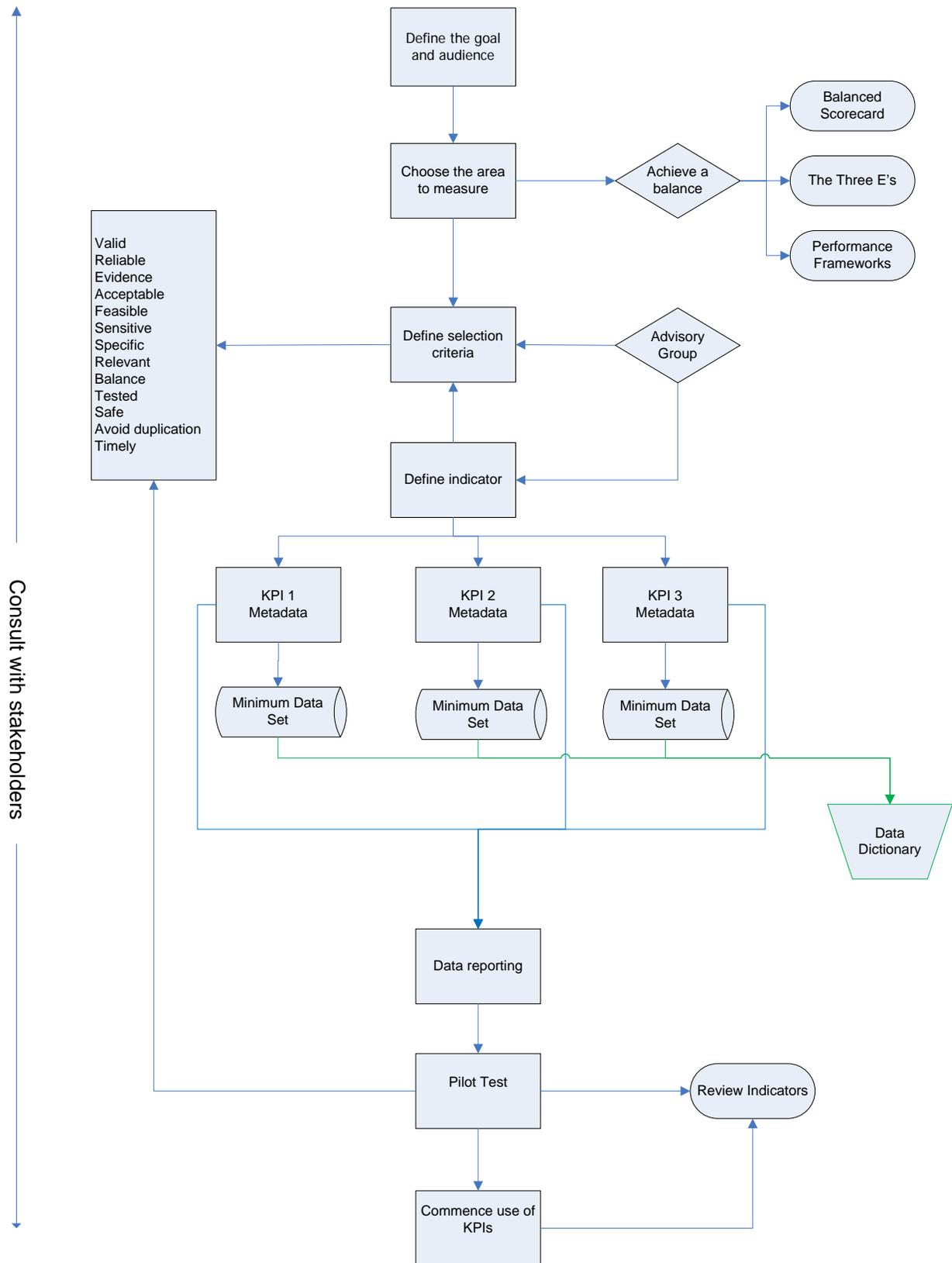


Figure 4: KPI development process

Consultation with decision-makers can assist in identifying their information needs and subsequent use for that information. Consultation with service providers can 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⁽³⁶⁾.

Where appropriate, consultation should include ongoing engagement and eventual endorsement by national or regional committees that have responsibility for health information and standards to ensure compliance.

Methods of consultation can vary from once-off meetings to regularly scheduled meetings with the advisory group and web forums. In keeping with best practice, consultation should be tailored to appropriately meet the needs of the situation - 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 facilitates guidance from all stakeholders and in particular from the expert panel.

The advisory group membership should include the relevant health professionals and stakeholders for the area being measured. An appropriately constituted advisory group will increase the likelihood that the chosen KPIs are fit-for-purpose and will be adopted. Group members should be independent, should not have a conflict of interest and have the primary objective of developing KPIs that provide a fair and accurate reflection of the area being measured. Processes are required to ensure advisory group members have the ability to be objective, have good teamwork and communication skills and be willing to commit sufficient time for background reading and to attend meetings⁽³⁷⁾.

The service user is the most important stakeholder in healthcare and their involvement is essential to help incorporate the consideration of those issues that are important to service users into the decision-making process for the delivery of healthcare. Sufficient support and processes should be put in place to facilitate the active participation of service users in the advisory group. Service users have a broad perception of healthcare quality that can include the availability of information, interpersonal relationships and the environment whereas healthcare professionals are more likely to focus on treatment outcomes⁽³⁸⁾. In addition, the inclusion of service users will encourage confidence in, and support for, healthcare delivery decisions when they are made⁽³⁹⁾. Service-user representation does not need to be in the form of a formally qualified member of the public but should be an individual who has experience and knowledge of issues that are important to service users⁽⁴⁰⁾.

Clinician membership should be multidisciplinary with members recognised as experts in their respective professions. This will enhance confidence in the validity of KPIs and will increase the likelihood of acceptance by professionals in the area being evaluated.

The advisory group should also include epidemiologists (or healthcare quality experts with experience in epidemiology) to ensure that the data collection and analysis methodology is reliable and valid. If it is not feasible for these professionals to be included then the team should, at a minimum, have access to this expertise in an advisory capacity. Consideration should also be given for the inclusion of data collectors and/or database managers as their experience in data collection will allow them contribute to the selection process.

Finally, the team should have access to administrators responsible for resource distribution for the topic area within the health and social care system for which KPIs are being developed. For national projects, the team should include membership from different geographical regions, however, the team should be kept relatively small to keep it focussed. For example, in the Danish National Indicator Project, groups consisted of eight to fifteen members representing healthcare professionals, relevant to the care of each condition being measured, 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⁽⁴¹⁾.

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

4.3 Choose the area to measure

Choosing the area to be measured should be based on the importance of the problem, service-user safety, potential for improvement and controllability by health or social care system/professionals.

A healthcare problem is important if it is associated with significant morbidity and mortality, has high service-user volumes and is costly to treat⁽⁴²⁾ for example, diabetes. Morbidity and mortality can be determined by epidemiological data, including mortality rates and disease prevalence. The importance of a health or social care problem can also be determined by resource utilisation associated with a particular condition.

Service-user safety should always be paramount in the delivery of healthcare and is recognised as a core domain of healthcare quality⁽⁴³⁾. Even though care is delivered by individuals, KPIs that identify patterns and trends can demonstrate the need for improvement in systems⁽⁴⁴⁾. Service-user safety KPIs 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 service-user safety KPIs monitor adverse events such as falls and bedsores.

As it is not possible to exhaustively monitor every aspect of healthcare 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 healthcare should be considered⁽⁴⁵⁾.

The process or outcome measure being assessed should be susceptible to influence by the healthcare system in relation to quality improvement⁽⁴⁶⁾. In other words, the healthcare system should have the ability to address any problems identified through measurement and likewise the measure should reflect policy/practice changes that contribute to quality improvement.

Together with the reasons for collecting data, such as improvements in the safety and quality of services, issues such as the efficient use of resources as a consequence of improvements resulting from the measurement process should be considered and are drivers towards the introduction of such a system.

4.4 Achieve a balance in measurement

The diversity of stakeholders in health and social care requires that there is a need for measures across multiple domains to satisfy their different information needs⁽⁴⁷⁾. A number of approaches have been developed to assist in identifying a balanced set of KPIs including:

- the “balanced scorecard” which was originally developed by Kaplan and Norton⁽⁴⁸⁾ and suggests four perspectives of a performance indicator set to provide a comprehensive view of the performance of an organisation:
 - **service user perspective** measures how an organisation meets the assessed needs and expectations of the service user
 - **internal management perspective** measures the key business processes that have been identified as necessary for a high 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⁽²⁸⁾ uses the three domains of economy, efficiency and effectiveness:
 - **economy** which measures the acquisition of human and material resources of the appropriate quality and quantity at the lowest cost
 - **efficiency** which measures the capacity to provide effective healthcare using minimum resources
 - **effectiveness** which measures the degree to which the organisation attains established goals.

- performance frameworks identify domains of healthcare performance that can be used as a basis for the development of performance indicator sets, such as the HCQI project⁽¹⁸⁾. In the United Kingdom, the performance assessment framework measures performance in six main areas:
 - health improvement
 - fair access
 - effective delivery of appropriate care
 - efficiency
 - service-user/carer experience
 - health outcomes.

- the process of achieving a balanced set of KPIs can be assisted by incorporating the structure, process and outcome classification into the methodology for assessing the healthcare system. These classifications are interdependent and structure can have an impact on processes which in turn can have an impact on outcomes.

4.5 Determine selection criteria

KPIs should be chosen based on the judgement and consensus of experts and potential users⁽⁴⁹⁾. Table 1 outlines a list of characteristics and related questions which can be used to assist in the identification of KPIs. Adapted from criteria developed by the World Health Organization (WHO)⁽³⁶⁾ and incorporating suggestions from stakeholders in the Irish health service, the questions outlined in Table 1 can also be used for testing KPIs once they have been developed.

Table 1: Selection Criteria

Validity	Does the KPI measure what it is supposed to measure?
<p>A valid KPI 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 KPIs 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.</p> <p>Content validity refers to whether the KPI captures important aspects of the quality of care provided. Face validity can be determined by the KPI making sense logically and clinically or from previous usage.</p>	
Reliability	Does the KPI provide a consistent measure?
<p>The KPI should provide a consistent measure in the same population and settings irrespective of who performs the measurement.</p> <p>Reliability is similar to reproducibility to the extent that if the measure is repeated you should get the same result. Any variations in the result of the KPI should reflect actual changes in the process or outcome. Reliability can be influenced by training, the KPI definition and the precision of the data collection methods⁽⁶⁾.</p> <p>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.</p>	
Explicit evidence base	Is the KPI supported by scientific evidence or the consensus of experts?
<p>KPIs should be based on scientific evidence, the consensus of expert opinions among health professionals or on clinical guidelines.</p> <p>The preferred method of choosing KPIs is through evaluating scientific evidence in support of each KPI 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⁽⁴⁶⁾.</p> <p>In healthcare, there may only be limited scientific evidence to support a KPI and it becomes</p>	

<p>necessary to avail of expert opinion⁽²⁷⁾. There are a number of methods by which a KPI can be developed through facilitating group consensus from a panel of experts, such as the Delphi technique, the RAND appropriateness method and from clinical guidelines. Appendix 2 gives a brief description of each method and Appendix 3 provides an example of a Delphi assessment instrument. The expert panel can exist independently of the advisory group and are used as a point of reference for the KPI development process.</p>	
Acceptability	Are the KPIs acceptable?
<p>The data collected should be acceptable to those being assessed and to those carrying out the assessment.</p>	
Feasibility	Is it possible to collect the required data and is it worth the resources?
<p>There should be a feasibility analysis carried out to determine what data are currently collected and the resources required to collect any additional required data.</p> <p>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 KPIs or benchmarking processes based on these data sources.</p> <p>The reporting burden of collecting the data contained in the KPI 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.</p> <p>The feasibility analysis should also include what means are used to collect data and the limitations of the systems used for collection. It should also outline the reporting arrangements, including reporting arrangements for existing data collection and frequency of data collection and analyses.</p>	
Sensitivity	Are small changes reflected in the results?
<p>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.</p>	

Specificity	Does the KPI actually capture changes that occur in the service for which the measure is intended?
Only changes in the area being measured are reflected in the measurement results	
Relevance	What useful decisions can be made from the KPI?
The results of the measurement should be of use in planning and the subsequent delivery of healthcare and contribute to performance improvement	
Balance	Do we have a set of KPIs that measure different aspects of the service?
The final suite of indicators should measure different aspects of the service in order to provide a comprehensive picture of performance, including user perspective ⁽²⁸⁾ .	
Tested	Have national and international KPIs been considered?
There should be due consideration given to indicators that have been tried and tested in the national and international arena rather than developing new indicators for the same purpose.	
Safe	Will an undue focus on the KPI lead to potential adverse effects on other aspects of quality and safety?
The indicator should not lead to an undue focus on the aspect of care being measured that may in turn lead to a compromise in the quality and safety of other aspects of the service.	
Avoid duplication	Has consideration been given to other projects or initiatives?
Prior to developing the indicator due consideration should be given to other projects or initiatives to ensure that there will not be a duplication of data collection.	
Timeliness	Is the information available within an acceptable period of time to inform decision-makers?
The data should be available within a time period that enables decision-makers utilise the data to inform their decision-making process. If the data is required for operational purposes, then it will be required within a shorter timeframe than data used for long term strategic purposes.	

4.6 Define the indicator

Appendix 4 provides a template with the type of detail that should be included when defining a KPI and Appendix 5 provides an example of a clinical KPI using this template. The template provides key elements that should be included when defining a KPI, however, the template can be adapted or customised to meet the needs of those that develop KPIs in different services. The Health Service Executive has adapted this template and it can be found on its website at following link:

<http://www.hse.ie/eng/services/Publications/corporate/performance-reports/kpi2013.doc>.

A clear definition of the indicator should be included to ensure that it is appropriately interpreted by those with responsibility for collecting the data. The definition should not be too complex to ensure that only the desired data is collected⁽²⁸⁾.

Including the rationale for the measurement will provide context and highlight the importance of the subject being measured.

4.6.1 Identify the target population

The calculation and presentation of results of the measurement requires that the target population are clearly identified. The target population is called the denominator and includes all service users 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 is called the numerator.

For example, if we were measuring the percentage of service users that receive thrombolytic therapy within 60 minutes of presenting to the emergency department following a myocardial infarction, the denominator includes all service users that receive thrombolytic therapy following presentation to the emergency department with acute myocardial infarction and the numerator includes all of the service users within that group that received thrombolytic therapy within 60 minutes.

More specific information regarding the target population can be given under the headings of inclusion criteria and exclusion criteria. Inclusion criteria outline specific parameters of the population for inclusion in the numerator and/or denominator that may not have been included in the KPI definitions.

Exclusion criteria describe 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.

We can also use tracer conditions to identify the target population, particularly when searching electronic records and in the above example the tracer condition is caesarean section. Using a tracer condition broadly identifies the target service-user population, but a more detailed definition of the target population will be specified by the KPI definition. The definition of the tracer condition should also include synonyms and International Classification of Diseases (ICD) and SNOMED (Systematised Nomenclature of Medicine-Clinical Terms) codes where applicable. ICD is an international diagnostic classification system used to classify diseases and other healthcare problems. SNOMED is a standard clinical language used by information systems to record healthcare encounters.

4.6.2 Define the target to be achieved

There should be a target set for the KPI to inform progress towards an acceptable level of performance and also to challenge the organisation or service to improve. According to the Sutherland and Leatherman⁽⁵⁰⁾ 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 can be⁽²⁸⁾:

- all-the-time targets, which aim to provide a level of service all the time
- percentage achievement targets, which aim to achieve a specified level of performance against a standard
- qualitative targets, which are descriptive of what standard of service to expect
- time-bound targets, which are one-off for a specific service
- national, regional or service specific targets, which are determined for a specific demographic or service area.

Targets should be realistic but also challenge service delivery towards improvement. They should be SMART, that is: specific, measurable, achievable, relevant and time-bound. For example, service users 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 service users with myocardial infarction should receive thrombolysis, some service users 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. It will be necessary to have baseline data in order to identify a target that is both achievable and challenging.

4.6.3 Threshold for 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.

4.6.4 Action

Unless actions are taken based on results, the measurement process will become an end in itself and will not contribute to quality improvement. 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.

5 Develop the Minimum Data Set (MDS)

A data set “is a set of data that is collected for a specific purpose”⁽³⁵⁾ and a minimum data set (MDS) is the core data identified as the minimum required for that purpose.

Once KPIs have been developed, it is necessary to determine what data needs to be collected for each KPI being used to measure performance. This should be achieved by creating a minimum data set and be based on what data is feasible to collect.

The minimum data set should be developed based solely on the essential data required to operationalise the KPI. As data collection can involve the use of additional resources it is essential that only the minimum amount of data, required to enable effective decision making, is collected⁽³⁶⁾. The MDS should be incorporated into a data dictionary to ensure the data is clearly defined and values are agreed. A data dictionary contains a list of data element definitions and attributes which supports the consistent collection of data for different purposes and by different people/organisations.

5.1 Define the level of health information

Ideally, for optimal data quality and in order to minimise any burden on resources, the required data should be collected as part of routine service delivery. Whether or not the available data meets the requirements of the measurement process should have been determined during feasibility testing. If requirements are not met there will be a need to collect additional data.

Data is routinely 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 as follows:

- **episode-level:** which 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 data such as socio-demographic details, referral details, and clinical details. Episode level data 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 for individuals is necessary in order to report episode-level information
- **case-level:** which is necessary to facilitate the management of care for each individual service user. Case-level data 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:** which is necessary to facilitate the management of the service facility. Facility-level data includes data relating to the facility such as number of beds, staffing, expenditure and also includes episode-level and case-level data
- **system-level:** which is necessary for policy and planning purposes on a system-wide or national basis. System-level data is an aggregate of all data elements in a particular region and is derived from episode, case and facility-level information.

Frequently, the KPI will require data to 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 service-user, while facility-level information needs only to be collected on an annual basis.

5.2 Define the frequency of collection

Some data may need to be collected on a daily basis while other data can be collected annually. The urgency of decisions to be made based on the KPI or the level of monitoring required, will determine the frequency of data collection.

5.3 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 which results in data standards that contribute to a consistent approach to data collection and use. Data standards are agreements on the representation, format, and definition of common data. These data standards will then assist in the process of ensuring data collection is of high quality and enable consistent and comparable reporting of data and information⁽⁵¹⁾.

Data can be collected manually, electronically or a combination of both. Methods of data collection need to be explored with the advisory group to determine the feasibility of the KPI 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 of 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.

5.4 Identify data sources

As part of documenting the data collection process data sources should be identified. The most efficient way to collect data is to incorporate the collection process into routine service-user care, which involves standardising documentation to ensure the required information is already being recorded for operational purposes.

Data sources/methods include:

- administrative databases, which 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, which are also readily available and contain more detail than administrative data, including diagnosis, treatment and outcome
- prospective data collection, which involves collecting data specifically for quality measurement purposes - it is more specific and can define exactly what data are required. It is, however, not readily available and expensive to collect
- survey data, which involves collecting data regarding knowledge, attitudes and behaviours and is not otherwise available. It is not readily available and is expensive to collect.

5.5 Identify data for development

Once a decision has been made on a KPI that fulfills the performance measurement aims and the MDS has been identified, each data element within the MDS should then be described in detail. High quality data collection processes in which the data set is well defined and standardised (see Table 2) ensures that the same data are not collected, counted or reported differently for different purposes⁽³⁵⁾. 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 should be clearly defined and standardised for comparability purposes and should not be reliant on or limited by the capability of one particular system, organisation or data collection tool⁽³⁵⁾.

Data set name	Waiting times for Emergency Department
Data element name	Time service user 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 service-user 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 service-user 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

Table 2: Example of data element attributes

5.6 Assess compliance with Information Governance

Healthcare information is sensitive and therefore provision must be made to ensure security and confidentiality of data held on service users. Information governance is the process whereby organisations and individuals ensure that personal information is handled legally, securely, efficiently and effectively, in order to deliver the best possible care. The data set should comply with data protection legislation and guidelines and should have respect for service users' privacy and confidentiality.

5.7 Plan data quality checks

There should be clear definitions for each data element in the MDS to ensure data collectors have a good understanding of what, how and when data needs to be collected. There should also be routine data 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.

6 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 results should be presented to allow the intended audience to easily interpret and use the information generated by the measure⁽⁴²⁾. 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.

Priority should be given to supporting the interpretation of results 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 all relevant audiences so that improvements can be made based on the available information.

Dashboards are one example of a method for presenting information to inform decision-making. Performance results are presented graphically through a series of charts, gauges or tables and facilitate comparison of actual performance against desired results. Dashboards can sometimes be colour coded to indicate performance against a goal or target. Colours can be used to represent performance, for example:

- green, to indicate good performance
- amber, to indicate average performance with room for improvement
- red, to indicate unsatisfactory performance requiring attention.

Information can also be presented using composite measures which present the results of performance measurement using a single score representing an aggregation of a number of underlying KPIs⁽⁵²⁾. Composite measures can provide a rounded picture of the performance of an organisation or system rather than trying to identify a trend from a range of individual KPIs⁽⁵³⁾. Each of the individual KPIs within the composite measure must satisfy the requirements of a good KPI, otherwise the composite measure will not represent an accurate picture of performance.

In certain instances weights are assigned to individual KPIs within a composite measure to reflect their priority or importance, so that individual KPIs within the subset contribute to a higher proportion of the result than the remaining KPIs.

For example, a composite measure that comprises seven indicators may assign a weight of 0.25 to 2 of the KPIs and 0.1 to each of the other 5. This weighting is then reflected in the overall result. There are, however, risks associated with aggregating the KPIs into a composite measure. It is possible to lose important information, such as serious failings in a particular part of the organisation, or to fail to identify specific areas where

significant improvement is required. The weighting system can also influence the result, particularly when used for benchmarking between service providers. Service providers that excel in the higher weighted KPIs will perform better than those that excel in the lower weighted KPIs, so the weighting methodology needs to be robust.

6.1 Determine frequency of processing and analysis

The frequency of processing and analysing the data collected should be determined to ensure the efficient use of resources and also meet the needs of the information user. 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.

6.2 Define method of analysis

A detailed protocol should be developed for presenting the result of the KPI. This should address issues such as missing data, risk adjustment, and also what is an acceptable level of performance or target to be achieved. In some cases the result can be presented as the proportion of the total population that have experienced the particular aspect of the service being measured. Other results can be based on the proportion that has achieved a particular standard or threshold.

6.2.1 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⁽⁴⁶⁾:

- rate-based KPIs: use information about events that are expected to happen frequently. The measurements can be represented as proportions or ratios, detailed as follows:
 - proportion KPIs: to allow comparisons between organisations or trends over a specified time they require both a numerator and a denominator. The KPI 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 KPIs is the proportion of cardiovascular related deaths that are male
 - ratio KPIs: the numerator is not contained in the denominator e.g. ratio of male to female cardiovascular related deaths.

- count KPIs: measure the number of events without a denominator. An example of a count KPI is the number of newly detected cases of tuberculosis in a given year
- sentinel KPIs: identify individual events that are inherently undesirable and usually warrant detailed analysis to determine why the event occurred. Sentinel events depict extremely poor performance. An example of a sentinel KPI is the number of deaths resulting from medical error.

6.3 Determine level of aggregation

Aggregation refers to the combination of results to provide a broader picture of performance over a geographic region or time period. Aggregation over space refers to the geographical region by which data will be reported, which could be nationally, within a specific health-delivery region or within a hospital or organisation. 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 system to which data are reported. For example, a hospital might request that data be aggregated to reflect performance within a specific service within the hospital on a monthly basis, whereas a health system might want the same data aggregated over a geographical region on an annual basis. The same data informs decision-making at both levels, but both needs are met by different levels of aggregation. What is important is that the same data is utilised both locally and nationally to inform practice and quality improvement initiatives.

6.4 Develop risk-adjustment strategy

There should always be consideration given to determine if a risk-adjustment strategy is necessary. A risk adjustment strategy reduces the possibility of external factors influencing the measure and ensures that the measure is a true reflection of the process being measured.

Certain characteristics related to the service-user or disease may influence the outcome, including age profile of the service-user population, co-morbidities, socio-economic features and service-user compliance. These prognostic factors should be identified and factored in to the measurement specifications through casemix adjustment models by epidemiologists to facilitate comparability. This may involve collecting additional data to assist in the analysis. Alternatively, restricting the measurement to a specific service-user population will ensure that service-user characteristics do not have an undue influence on the comparison process.

7 Pilot test KPIs

Even though a considerable amount of time and effort will have been spent designing the specifications, it is necessary to test the KPI 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 there should be 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⁽⁵⁴⁾:

- are there validity and reliability issues in relation to data collection?
- is the information obtained from the KPI of use in decision-making?
- can the KPIs 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 KPIs to be rolled-out successfully?
- are there any modifications necessary to the KPI specifications?

The pilot test can also be used to validate the KPIs against the selection criteria used for developing the KPIs (Table 1).

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

7.1 Determine review frequency

There should be a plan to review the KPI at regular intervals with a view to refinement in response to stakeholder demands or improved data availability. Health services are continually evolving and it is important that KPIs respond to these changes. There should be a date set for reviewing the KPI to ensure that it is still relevant and up to date.

The review may highlight the need to modify the KPI or aspects of the KPI in response to stakeholder demands, improved data availability and changes in 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, KPIs should not be amended too frequently. To support trending over time and comparability there should be strong business rules on which the decision to amend or discontinue existing KPIs is based.

8 Conclusion

Access to and use of good quality information is a key component of performance measurement and improvement for high quality, safe and reliable healthcare. Performance improvement involves monitoring the current level of performance and instituting changes where performance is not at the desired level. KPIs support organisations improve the safety and quality of care by providing information about the current level of performance and identifying where there are opportunities for improvement.

This document has been developed as a resource to support stakeholders in the process of developing KPIs and associated MDSs used for monitoring the quality and safety of health and social care. The guidance identifies important factors to be considered when developing and identifying KPIs and has been identified through an extensive synthesis and analysis of the literature.

KPIs that have been identified and developed based on the factors identified in this document are more likely to lead to measurements that can be confidently relied upon by decision makers. Data collection to support the KPI measurement process is more efficient if it is incorporated into routine care. It is important that each KPI and the associated MDS is clearly defined, so that the result of the measurement reflects actual changes in the quality and safety of care.

Having completed this guidance, the Authority will continue to develop and publish additional documents to support improvements in the quality and safety of healthcare.

Reference List

- (1) Smith PC, Mossialos E, Papanicolas I. *Performance measurement for health system improvement: experiences, challenges and prospects*. World Health Organisation; 2008.
- (2) Kohn LT, Corrigan JM, Donaldson MS. *To Err is Human: Building a Safer Health System*. Washington: National Academies Press; 1999.
- (3) Berwick DM, James B, Coye MC. Connections Between Quality Measurement and Improvement. *Medical Care*. 2003; 43(1, Supplement): p.i30-i38.
- (4) Department of Health (United Kingdom). *High Quality Care for All: NHS Next Stage Review Final Report*. London: Department of Health; 2010.
- (5) Raleigh VS, Foot C. *Getting the Measure of Quality: Opportunities and challenges*. The Kings Fund; 2010.
- (6) 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): pp.489-96. Available online from: <http://intqhc.oxfordjournals.org/cgi/reprint/13/6/489>.
- (7) Rubin HR, Pronovost P, Diette GB. The advantages and disadvantages of process-based measures of health care quality. *International Journal for Quality in Health Care*. 2001; 13(6): pp.469-74.
- (8) Donabedian A. *An Introduction to Quality Assurance in Health Care*. Oxford University Press; 2003.
- (9) Donabedian A. The Quality of Care: How Can It Be Assessed? *Journal of the American Medical Association*. 1988; 260(12): pp.1743-8. Available online from: http://post.queensu.ca/~hh11/assets/applets/The_Quality_of_Care_How_Can_it_Be_Assessed_-_Donabedian.pdf.
- (10) Mainz J. Defining and classifying clinical indicators for quality improvement. *International Journal for Quality in Health Care*. 2003; 15(6): pp.523-30.
- (11) 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 pp.377-98. Available online from: <http://intqhc.oxfordjournals.org/cgi/reprint/15/5/377>.

- (12) 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 pp.67-73.
- (13) Øvretveit J. Formulating a health quality improvement strategy for a developing country. *International Journal of Health Care Quality Assurance*. 2004; 17(7): pp.368-76.
- (14) Institute of Medicine. Health, Health Care, and Quality of Care. Kathleen N.Lohr, (Ed) In: *Medicare: A Strategy for Quality Assurance*. 1st Edition. 1990. p.21. Available online from: http://books.nap.edu/openbook.php?record_id=1547&page=21. Accessed on: 7 January 2009.
- (15) McGlynn EA. Six Challenges in Measuring the Quality of Health Care. *Health Affairs*. 1997; 16(3):
- (16) Mant J. Process versus outcome indicators in the assessment of quality of health care. *International Journal for Quality in Health Care*. 2001; 13(6): pp.475-80.
- (17) Miller T, Leatherman S. The National Quality Forum: A 'Me-Too' or a Breakthrough in Quality Measurement and Reporting? *Health Affairs*. 1999; 18(6): pp.233-7.
- (18) Kelley E, Hurst J. Health Working Papers. *Health Care Quality Indicators Project Conceptual Framework Paper*. Organisation for Economic Co-operation and Development; Report No.: Health Working Papers No. 23. 2006.
- (19) 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; pp.5-13. Available online from: http://intqhc.oxfordjournals.org/cgi/reprint/18/suppl_1/5.
- (20) World Health Organisation. *The determinants of health* [Online]. Available from: <http://www.who.int/hia/evidence/doh/en/>. Accessed on: 2 February 2010.
- (21) Shaw C. *How can hospital performance be measured and monitored?* World Health Organisation; 2003.
- (22) Selznick P. Noll R, (Ed.). *Focusing organisational research on regulation*. Berkeley: University of California Press; 1985. pp.363-8.
- (23) Marshall M, Campbell Stephen. Introduction to quality indicators in general practice. Marshall M, Campbell Stephen, Hacker J, Roland M, (Eds) In: *Quality indicators for general practice: A practical guide for health professionals and managers*. The Royal Society of Medicine Press Ltd; 2002.

- (24) Turpin RS, Darcy LA, McMahon 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): pp.321-9. Available online from: <http://intqhc.oxfordjournals.org/cgi/reprint/8/4/321>.
- (25) 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; pp.45-51.
- (26) Pringle M, Wilson T, Grol R. Measuring "goodness" in individuals and healthcare systems. *British Medical Journal*. 2002; 325 pp.704-7.
- (27) 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 pp.358-64.
- (28) Audit Commission. *On Target: the practice of performance indicators*. Audit Commission for Local Authorities and the National Health Service in England and Wales; 2000. Available online from: http://www.audit-commission.gov.uk/Products/NATIONAL-REPORT/266D51B7-0C33-4b4b-9832-7484511275E6/archive_mptarget.pdf.
- (29) Bridgewater B, Grayson AD, Brooks N, Grotte G, Fabri BM, Au J, et al. Has the publication of cardiac surgery outcome data been associated with changes in practice in northwest England: an analysis of 25,730 patients undergoing CABG surgery under 30 surgeons over eight years. *Heart*. 2007; 93 pp.744-8.
- (30) Dranove D, Kessler D, McClellan M, Satterthwaite M. Is more information better? The effects of 'report cards' on health care providers. *Journal of Political Economy*. 2003; 111(3):
- (31) Commission for Healthcare Audit and Inspection. *Investigation into Mid Staffordshire NHS Foundation Trust*. Healthcare Commission; 2009. Available online from: [http://www.cqc.org.uk/db/documents/Investigation into Mid Staffordshire NHS Foundation Trust.pdf](http://www.cqc.org.uk/db/documents/Investigation%20into%20Mid%20Staffordshire%20NHS%20Foundation%20Trust.pdf).
- (32) Helfert M, Henry P, Leist S, Zellnor G, Koliman KS, (Ed.). *Healthcare performance indicators - Preview of frameworks and an approach for healthcare process-development*. 2005. pp. 371-8.
- (33) McLoughlin V, Leatherman S, Fletcher M, Owen J. Improving performances using indicators. Recent experiences in the United States, United Kingdom and Australia. *International Journal for Quality in Health Care*. 2009; 13(6): pp.455-62.

- (34) Healthcare Commission. *The Better Metrics project*. Healthcare Commission; Report No.: Version 8. 2007. Available online from: http://www.cqc.org.uk/db/documents/Better_Metrics_full_report.pdf.
- (35) AIHW. *A guide to data development*. Australian Institute of Health and Welfare (AIHW); Report No.: AIHW Cat. no. HWI 94. 2007.
- (36) WHO. *Mental Health Information Systems (Mental Health Policy and Service Guidance Package)*. World Health Organisation; 2005.
- (37) Scottish Intercollegiate Guideline Network. *SIGN 50: A guideline developer's handbook*. 2008.
- (38) Comptroller and Auditor General. *Special Report: Health Service Executive - Emergency Departments*. Government of Ireland; 2009.
- (39) Bruni RA, Martin DK. Public engagement in setting priorities in health care. *Canadian Medical Association Journal*. 2008; 179(1): pp.15-8.
- (40) National Health and Medical Research Council. *A guide to the development, implementation and evaluation of clinical practice guidelines*. Australia: National Health and Medical Research Council; 1999.
- (41) Mainz J. *The National Indicator Project* [Online]. Available from: <http://www.hpm.org/survey/dk/a12/3>. Accessed on: 4 February 2008.
- (42) McGlynn E, Asch S. Developing a Clinical Performance Measure. *American Journal of Preventive Medicine*. 1998;(14): pp.14-21.
- (43) Kristensen S, Mainz J, Bartels P. Safety Improvement for Patients in Europe. *Establishing a Set of Patient Safety Indicators: Safety Improvement for Patients in Europe*. European Society for Quality in Health Care; Report No.: WP4. 2007. Available online from: http://www.esqh.net/www/projects/simpatie/files/folder_1183979816/Patient_safety_indicator_development.pdf. Accessed on: 13 January 2009.
- (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(4 Part 2): pp.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; Report No.: OECD Health Technical Papers No.18. 2004.
- (46) 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):

p.i5-i11. Available online from:

http://intqhc.oxfordjournals.org/cgi/reprint/15/suppl_1/i5.

- (47) 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 pp.71-4.
- (48) Kaplan RS, Norton DP. The Balanced Scorecard - Measures that Drive Performance. *Harvard Business Review*. 1992; 70(1): pp.71-9.
- (49) Bodart C, Shrestha L. Identifying information needs and indicators. In: *WHO, Design and implementation of health information systems*. Geneva. World Health Organisation; 2000. pp.49-72.
- (50) Sutherland K, Leatherman S. Quest for Quality and Improved Performance. *Regulation and Quality Improvement: A review of the evidence*. London: The Health Foundation; 2006.
- (51) AIHW. *National Health Data Dictionary: Version 14*. Canberra, Australia: Australian Institute of Health and Welfare; 2008.
- (52) Jacobs R, Goddard M, Smith PC. *Public Services: Are composite measures a robust reflection of performance in the public sector*. Center for Health Economics, York: CHE Research Paper 16; 2006.
- (53) Smith PC. Developing composite indicators for assessing health system efficiency. In: *Measuring up: Improving the performance of health systems in OECD countries*. Paris. OECD; 2002.
- (54) Kazandjian V, Reid T. *Healthcare Performance Measurement*. American Society for Quality; 1999. Available online from:
http://books.google.com/books?id=GyPmaat8lcUC&pg=PA155&lpg=PA155&dq=pilot+test+performance+indicators&source=bl&ots=ADwhvHk_qa&sig=3ETbXp-qWIB3VwGupzpkCC79k6s&hl=en&ei=i1bCSYThO-S1jAelo9msCw&sa=X&oi=book_result&resnum=3&ct=result#PPR12,M1.
Accessed on: 19 March 2009.

Glossary of terms

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. These are service user perspective, internal management perspective, continuous improvement perspective and financial perspective.

BENCHMARK:

A point of reference or standard by which something can be measured

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.

CASEMIX:

Casemix is an internationally recognised system of measuring clinical activity incorporating the age, gender and health status of the population served by an organisation with a view to objective determination of hospital reimbursement.

DATA:

Data are numbers, symbols, words, images, graphics that have yet to be organised or analysed

DATA DICTIONARY:

A descriptive list of names (also called representations or displays), definitions, and attributes of data elements to be collected in an information system or database.

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.

DOMAINS OF QUALITY:

Are those definable, preferably measurable and actionable, attributes of the system that are related to its functioning to maintain, restore or improve health

HEALTH INFORMATION:

Health Information is defined as information, recorded in any form or medium, which is created or communicated by an organisation or individual relating to the past, present or future, physical or mental health or social care of an individual or cohort. It also includes information relating to the management of the health and social care system

METADATA:

Data that defines and describes other data

MINIMUM DATA SET:

The minimum set of data elements that are required to be collected for a specific purpose

NHS TRUST:

A National Health Service Trust provides services on behalf of the National Health Service (NHS) in England and Wales. There are different types of Trusts, each responsible for specific services such as Primary Care Trusts, Acute Trusts, Ambulance Trusts, Care Trusts and Mental Health Trusts

NUMERATOR:

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

KEY 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, processes or outcomes that may be correlated with the quality of care delivered by the healthcare system.

PROCESS INDICATORS:

Performance indicators that monitor the activities carried out in the assessment/diagnosis and treatment of service users.

OUTCOME INDICATORS:

Performance indicators that monitor the desired states resulting from care processes, which may include reduction in morbidity and mortality, and improvement in the quality of life.

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:

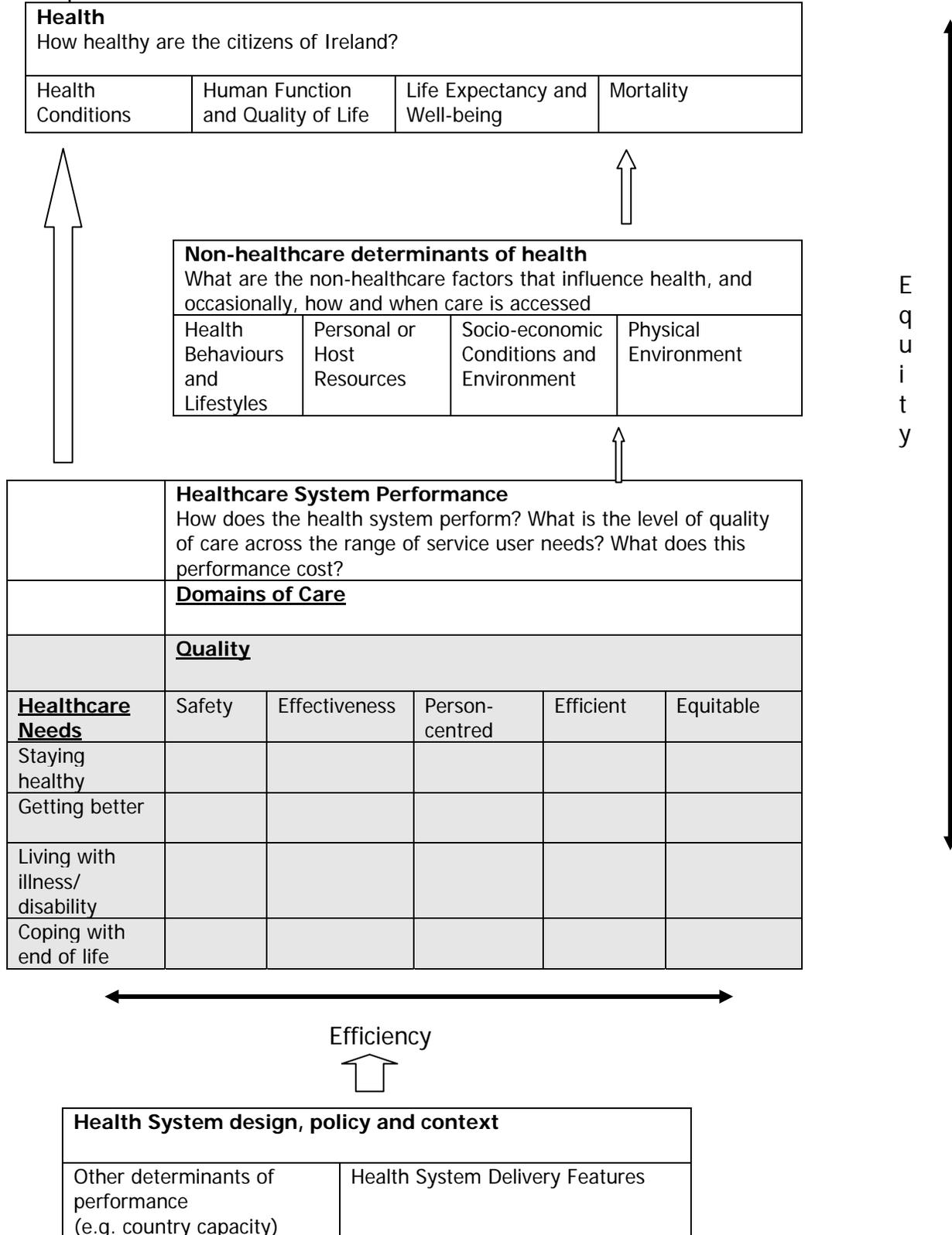
Performance indicators that monitor the attributes of the health system that contribute to its ability to meet the healthcare needs of the population.

VALIDITY:

Validity of indicators refers to whether performance indicators are measuring what they are supposed to measure.

Appendix 1: HCQI Framework

Adapted from Arah et al



Appendix 2: Examples of consensus techniques

The Delphi technique is a facilitated structured process whereby a panel of experts complete questionnaires (see Appendix 3 for example) remotely and, through feedback and scoring over a number of rounds where some KPIs are discarded, a consensus is achieved on a final set of KPIs. 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 KPIs. Unlike the Delphi technique the expert panel meet face-to-face to discuss possible KPIs and are given a copy of the scientific literature in support of the KPIs so that they can ground their opinion on evidence-based literature⁽²⁷⁾.

KPIs can also be developed based on **clinical guidelines**. An acceptable method of developing KPIs using guidelines is the iterated consensus technique whereby KPIs are selected based on the perceived impact of the guideline on the outcome of care⁽²⁷⁾.

Appendix 3: Delphi study example of brief assessment instrument

Scoring Matrix				
Domain	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 • 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 4 : KPI Template

* This template provides key elements that should be included when defining a KPI, however the template can be adapted or customised to meet the needs of those that develop KPIs in different services.

1.	KPI Title	Exact title of the KPI.
2.	KPI Description	Description of the KPI including a description of the target population.
3.	KPI Rationale	Rational for the measurement of the KPI.
4.	KPI Target	Indicate the target for the KPI – a target should be set for the KPI to inform progress towards an acceptable level of performance (see page 34 for more information on targets).
5.	KPI calculation	<p>Indicate how the KPI will be calculated. This should contain information on the numerator and denominator. This should also contain information on the inclusion and exclusion criteria.</p> <p>The target population is called the <u>denominator</u> and includes all services users or events that qualify for inclusion in the measurement process.</p> <p>The subset of the target population that meets the criteria as defined in the indicator is called the <u>numerator</u>.</p>
6.	Data Source(s)	Indicate what data source(s) will be used for the KPI for example data sources include administrative databases, medical records, national health information resources and or survey data.
7.	Data collection frequency	<p>Indicate how often the data to support the KPI will be collected</p> <p> <input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Bi-annually <input type="checkbox"/> Annually <input type="checkbox"/> Other – give details: _____ </p>

8.	Tracer conditions	Indicate the terms which should be used to identify what should be included in the data. This should include synonyms, International Classification of Disease (ICD) and SNOMED (Systematised Nomenclature of Medicine Clinical Terms) where applicable.
9.	Minimum Data Set	Indicate what core data items (with definitions) should be collected for the purpose of reporting the KPI.
10.	International comparison	Indicate if this KPI is collected in other jurisdictions outside of Ireland and therefore allows for international comparison.
11.	KPI monitoring	Indicate how often the KPI will be monitored and by whom
12.	KPI reporting frequency	Indicate how often the KPI will be reported <input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Bi-annually <input type="checkbox"/> Annually <input type="checkbox"/> Other – give details: _____
13.	KPI report period	Indicate the period to which the data applies <input type="checkbox"/> Current (e.g. daily data reported on that same day of activity, monthly data reported within the same month of activity) <input type="checkbox"/> Monthly in arrears (June data reported in July) <input type="checkbox"/> Quarterly in arrears (quarter 1 data reported in quarter 2) <input type="checkbox"/> Rolling 12 months (previous 12 month period) <input type="checkbox"/> Other – give details: _____
14.	KPI reporting aggregation	Indicate the level of aggregation – this refers to the combination of results to provide a broader picture of performance for example over a geographical location. <input type="checkbox"/> National <input type="checkbox"/> Regional <input type="checkbox"/> LHO Area <input type="checkbox"/> Hospital <input type="checkbox"/> County <input type="checkbox"/> Institution <input type="checkbox"/> Other – give details: _____
15.	KPI is reported in which reports	Indicate where the KPI will be reported for example the KPI may be

		reported in yearly service plans or in monthly performance reports.
16.	Web link to data (where available)	Indicate the link to where the data is located (where relevant)
17.	Additional Information	Any other relevant information relevant to the KPI
	Contact details for person responsible for the KPI	Name Contact Details
	Details of the approval process for the KPI	Name Date Version

Appendix 5: Example of a clinical KPI

1.	KPI Title	Time to thrombolysis
2.	KPI Description	Percentage of patients with Acute Myocardial Infarction (AMI) requiring thrombolysis who receive thrombolytic therapy within 60 minutes of presentation to the Emergency Department
3.	KPI 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.
4.	KPI Target	<ul style="list-style-type: none"> • 65% of eligible patients presenting with AMI <li style="text-align: center;">or • > 50% with a 20% improvement from 2009
5.	KPI calculation	<p>Numerator divided by denominator expressed as a percentage</p> <p>Numerator: Total number of patients with a diagnosis of AMI requiring reperfusion who receive thrombolytic therapy within 60 minutes of presentation to the Emergency Department</p> <p>Denominator: Total number of patients with a diagnosis of AMI requiring reperfusion who receive thrombolytic therapy following presentation to the Emergency Department</p>
6.	Data Source(s)	<ul style="list-style-type: none"> • Administrative data • Medical Record
7.	Data collection frequency	<input checked="" type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Bi-annually <input type="checkbox"/> Annually <input type="checkbox"/> Other – give details: _____
8.	Tracer conditions	Acute Myocardial Infarction (AMI)

		<p>Synonyms: Myocardial Infarction (MI) Cardiac Infarction Heart Attack</p> <p>SNOMED CT: ConceptID 57054005</p> <p>ICD-10-AM codes: 121.0, 121.1, 121.2, 121.3, 121.4, 121.9</p>																															
9.	Minimum Data Set	<table border="1"> <tr> <td>Local service-user identifier</td> <td>The number used to identify a service user uniquely by a care provider</td> </tr> <tr> <td>UHI:</td> <td>Unique Health Identifier (not yet applicable)</td> </tr> <tr> <td>First name:</td> <td>Main first name of service user</td> </tr> <tr> <td>Surname:</td> <td>Surname on birth cert or passport</td> </tr> <tr> <td>Date of birth:</td> <td>Date on birth cert or passport</td> </tr> <tr> <td>Gender:</td> <td>At time of diagnosis</td> </tr> <tr> <td>Date patient presents:</td> <td>The date of arrival</td> </tr> <tr> <td>Time patient presents:</td> <td>The time of arrival</td> </tr> <tr> <td>AMI Diagnosis:</td> <td>This is a working diagnosis at the time of admission</td> </tr> <tr> <td>Reperfusion type:</td> <td>Thrombolysis, PTCA, referred elsewhere for PTCA, reperfusion not attempted</td> </tr> <tr> <td>Thrombolytic drug:</td> <td>The name of the drug administered as thrombolytic therapy</td> </tr> <tr> <td>Time thrombolysis started:</td> <td>The time thrombolysis commenced</td> </tr> <tr> <td>Thrombolysis treatment location:</td> <td>Where was thrombolysis commenced e.g. pre-hospital, ED, CCU, ward, etc..</td> </tr> <tr> <td>Thrombolysis delay reason:</td> <td>Identifies a justified reason for delay in commencing thrombolysis e.g. uncontrolled hypertension, delay in obtaining consent, initial ECG not diagnostic, etc..</td> </tr> <tr> <td>Reason thrombolysis not given:</td> <td>Identifies the reason why thrombolysis was not given e.g. too late, patient refused, uncontrolled hypertension, elective decision, etc..</td> </tr> </table>	Local service-user identifier	The number used to identify a service user uniquely by a care provider	UHI:	Unique Health Identifier (not yet applicable)	First name:	Main first name of service user	Surname:	Surname on birth cert or passport	Date of birth:	Date on birth cert or passport	Gender:	At time of diagnosis	Date patient presents:	The date of arrival	Time patient presents:	The time of arrival	AMI Diagnosis:	This is a working diagnosis at the time of admission	Reperfusion type:	Thrombolysis, PTCA, referred elsewhere for PTCA, reperfusion not attempted	Thrombolytic drug:	The name of the drug administered as thrombolytic therapy	Time thrombolysis started:	The time thrombolysis commenced	Thrombolysis treatment location:	Where was thrombolysis commenced e.g. pre-hospital, ED, CCU, ward, etc..	Thrombolysis delay reason:	Identifies a justified reason for delay in commencing thrombolysis e.g. uncontrolled hypertension, delay in obtaining consent, initial ECG not diagnostic, etc..	Reason thrombolysis not given:	Identifies the reason why thrombolysis was not given e.g. too late, patient refused, uncontrolled hypertension, elective decision, etc..	
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10.	International comparison	Care Quality Commission, UK																															
11.	KPI monitoring	This will be monitored on a monthly basis by XXX																															
12.	KPI reporting frequency	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input checked="" type="checkbox"/> Quarterly <input type="checkbox"/> Bi-annually <input type="checkbox"/> Annually <input type="checkbox"/> Other – give details: _____																															
13.	KPI report status	Indicate the status of the data reported <input checked="" type="checkbox"/> Current <input type="checkbox"/> Monthly in arrears <input type="checkbox"/> Quarterly in arrears <input type="checkbox"/> Rolling 12 months <input type="checkbox"/> Other – give details: _____																															

14.	KPI reporting aggregation	<input checked="" type="checkbox"/> National <input checked="" type="checkbox"/> Regional <input type="checkbox"/> LHO Area <input checked="" type="checkbox"/> Hospital <input type="checkbox"/> County <input type="checkbox"/> Institution <input type="checkbox"/> Other – give details: _____
15.	KPI is reported in which reports	This KPI will be reported in the national monthly performance reports and these are available from XX
16.	Web link to data (where available)	Not applicable
17.	Additional Information	
	Contact person for the KPI	
	Details of approval process for the KPI	

Published by the Health Information and Quality Authority

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