Healthcare Quality Atlas

A description of the quality of treatment in a selection of essential healthcare services for the years 2017–2019

Helseatlas | SKDE

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Preface by Health North – the Northern Norway RHA

Need for rigorous quality management

The Norwegian Centre for Clinical Documentation and Evaluation (SKDE) has a long tradition of delivering knowledge about variations in the availability and utilisation of healthcare services nationwide. It is vital that patients, families and the population as a whole receive the best possible specialist health services in terms of content and also scope. The available data, as now presented in this new Healthcare Quality Atlas 2017–2019, are an essential first step towards achieving the government's desired reductions in unnecessary waiting times and geographical variation. Patients should not have to wait needlessly for examination and treatment, and healthcare services throughout the country must offer equal quality wherever you live.

International comparisons show that the quality of treatment of patients in Norway is generally good. At the same time, we must acknowledge that there are a number of areas where there is room for improvement. Results from the National Medical Quality Registries are a key source of insight that must be available and utilised to develop safer and more equitable healthcare services to all. This Healthcare Quality Atlas takes the data already reported and correlates the results to produce new understanding. Data from twelve quality registries was used in this Atlas to illustrate how clinical examination, medical treatment and procedural outcomes compare in groups of patients with serious diseases. Overall, the Atlas reveals that quality can vary quite considerably depending on the patient's place of residence.

There is a need for more robust quality management in the specialist health service, and it is primarily a managerial responsibility to lay the groundwork for this. Low target attainment over several years for some quality indicators is a clear sign that more dedicated efforts are required, plus a discussion and analysis of which procedures give the desired result. Quality improvements will of course always depend immensely on the efforts of medical staff with high professional competence and long experience. A key to improving quality is to refine and enhance the vital patient-facing processes in consultation with the patients.

Visualisation of quality data supports the principles of openness and transparency – besides promoting a culture of quality and improvement work. Patients, users and families must have access to data on quality and quality variation. Staff and managers will use the quality data to prioritise the results and treatment procedures that need review and improvement. Quality data will help staff run hospitals and institutions in the optimal way, implement the changes needed, evaluate the effects of the work done, and diligently correct inconsistencies when and where required. Quality is all about the patient experience, treatment result, and patient safety; and at the very heart of the specialist healthcare service is the work to achieve this end. Quality performance data is a key prerequisite for success in the improvement process. This Healthcare Quality Atlas provides useful key metrics and clearly identifies where there is a need for hard work and continuing dedication.

Cecilie Daae
Chief Executive Officer
Health North RHA – The Northern Norway Regional Health Authority

Preface by Patient ombudswoman

This Healthcare Quality Atlas provides an opportunity to look more closely at variation in the quality of healthcare services depending on the place of residence of the patient. This knowledge is an important starting point in order to reduce differences in healthcare services offered, and can enhance the quality of healthcare services to the individual.

Norway offers generally sound healthcare services and people's confidence – not least in the individual healthcare worker – is high. In order to deserve this confidence, it is important that patients receive high-quality essential healthcare regardless of age, place of residence, and personal expertise.

In Norway, the government has passed a dedicated Patient Rights Act intended to promote precisely this. Yet it is important to emphasise that it is the health service, and not the individual patient, which is responsible for practical implementation.

The Results chapter in this Healthcare Quality Atlas concludes that "Even if the national results overall were good, at the same time the attainment levels were variable, and that included geographical variation in quality for a number of the indicators."

A comparison of quality indicators reveals variations in quality that are hard to accept without further explanation. For example it is concerning that patients living in some referral areas may be facing shorter survival times after a cancer diagnosis, than patients in other post-codes.

The follow-up of this report should of course focus on the quality work done in the Regional Health Authorities as part of their duty of care to provide essential health services, and in the individual hospital trusts and healthcare institutions.

Anne-Lise Kristiansen
Patient Commissioner and Ombud in Oslo and Akershus
Social Services and Elderly Commissioner and Ombud in Oslo

Summary

In this *Healthcare Quality Atlas 2017–2019*, we describe quality indicators for selected essential healthcare services broken down by the various hospital trust referral areas. Each hospital trust is responsible for the patients in its respective referral area as defined by component districts and municipalities. Thus, it is the place of residence of the patient, and not the location of the hospital where the patient was treated, that is used in this analysis of the quality data. Among the conditions analysed are severe cardiovascular disease, cancer, diabetes, kidney failure and hip fracture. Data in the Atlas has been compiled in consultation with 12 national Medical Quality Registries, with results based on 31 preselected and predefined quality indicators that say something about the quality of the essential health services. The results represent selected disciplines within the specialist health service during the period 2017–2019.

What is revealed is significant variation in quality for many indicators across the various referral areas. Accordingly, patients living in some referral areas accessed better quality of certain essential health services than their counterparts in other areas. The causes of this disparity are no doubt many and complex, but one key cause seems to be the variance in professional practices from area to area. It means that professional guidance was not always fully complied with.

Some sectors of the essential health services reported consistently low attainment of quality targets. A low result for the same indicators across multiple referral areas suggests that the quality nationwide does not meet the predefined clinical standard. Consistently low target attainment for a given indicator suggests that the challenge is not varying practices, but a more overall or systematic cause. Where there is universally low attainment, it might be useful to explore whether the challenges lie in the organisation of the service, or whether the result is due to an overambitious target level.

For some quality indicators, most referral areas achieved high target attainment, indicating that the quality of the particular treatment in question was generally good. From a regional viewpoint, the results showed little geographical variation, as was expected. Overall nationwide, attainment was at a moderate or high level for many indicators.

Notwithstanding the above, this current *Healthcare Quality Atlas* is more than anything else compelling evidence of geographical variation in all the clinical disciplines analysed. Such variation suggests varying practices within the healthcare services for serious disease, and that for our selection of essential health services the conclusion must be that equitable quality was not achieved. This suggests that the duty of care of the hospital trusts and healthcare institutions to provide all patients suffering from serious disease with essential health services was not fully met. Geographical variations in quality of treatment of serious disease are not at all desirable, and this Atlas can provide a starting-off point for determined efforts to reduce such undesirable variations.

Contents

Chapter 1

Introduction

Our public health and welfare services must achieve both high quality and equitable delivery, unbiased by place of residence or socio-economic status. Norway's four Regional Health Authorities are committed to the provision of adequate and robust specialist health services of appropriate size and quality for the populations in their respective Health Region. This entails systematic and targeted efforts to upgrade quality and patient safety in the best interests of patients. Quality excellence is recognised by the efficacy of the services, patient safety and security, involvement and input by the users, coordination and continuity, proper utilisation of available resources and ensuring accessibility and equitable delivery. The aim of this Healthcare Quality Atlas is to measure the quality of examination, treatment and follow-up phases in the specialist health service, for patient groups with serious cardiac and coronary disease, cancer, diabetes, kidney disease and hip fracture. The report presents selected quality indicators from the national quality registries, comparing the results across referral areas and Regional Health Authorities. Since the patient's place of residence, referral area and region form the basis for the analyses, rather than the treatment sectors, the data in this Atlas may provide a useful insight regarding the duty of care to provide essential health services afforded by each Regional Health Authority. Moreover, the Atlas offers a guideline for regional quality improvement programs, especially for specialist services that are functionally distributed across the Regional Health Authorities.

Why have a Healthcare Quality Atlas for treatment of serious disease?

If the specialist health services delivered to patients vary greatly in quality, it is fair to ask whether the duty of care to provide essential health services is properly fulfilled. A Healthcare Atlas that highlights geographical variation of treatment quality may help collate useful data as a basis for improvement. The national criteria for prioritizing health services, namely efficacy of treatment, deployment of resources and seriousness of condition, help us describe a more equitable distribution and optimal health-for-resources ratio in the health service. In this Atlas, we will take a closer look at some of the essential health services for serious disease. Variation in treatment quality is never desirable, but such variation is especially problematic in the case of serious disease. This Healthcare Quality Atlas builds on the national quality registries for each medical discipline, which compile data, perform analyses, and communicate the results. The majority of quality registries present their results based on clinical venue, so the result is tabulated based on the hospital where the patient was treated. In this Healthcare Atlas, it is the place of

residence of the patient that is the basis for the analyses. The goal is to highlight geographical variations in quality, and determine whether health services are equitably distributed regardless of place of residence. The focus is on whether the duty of care to provide essential health services and quality of outcome are equally fulfilled regardless of where the patient lives, rather than on whether individual hospitals, clinics and institutions have a potential for quality improvement. This Healthcare Atlas will thus provide a supplement to Health Trust-specific and hospital-specific results, which is how the quality results are usually communicated.

Chapter 2

Method

2.1 Purpose

The purpose of this Healthcare Quality Atlas is to describe the quality of selected essential health services broken down by patients' place of residence and thus referral area.

2.2 Data basis and coordination with medical quality registries

This Healthcare Quality Atlas has been prepared in close collaboration with 12 of Norway's 51 Medical Quality Registries nationwide. In most cases, the Medical Quality Registries have been built up by the specialist environments in the health service, and compile data on examination, treatment, outcome, and follow-up of patients within the defined disease categories. The main purpose of the registries is to promote better quality for patients. The criteria that were used for the choice of registries for our project included:

- Registry compiles reports on essential health services

Essential health services are those for which the necessity for treatment is unquestioned, there is broad professional consensus about the treatment to be administered, and on whether the treatment is effective (Wennberg 2010).

- Registry has defined quality indicators

A quality indicator is an indirect metric, a measure, that says something about the quality of the category under measurement (Helsedirektoratet 2020)

- Over 60 % coverage

The target population of the registry is the population it aims to report. The coverage ratio of a registry is a measure of how large a proportion of the target population is actually reported in the registry.

- High level of support and acceptance by relevant hospitals

The level of support and acceptance shows how large a proportion of relevant hospitals report their data to the registry.

- Adequate patient volume to permit analysis by place of residence and thus referral area

Based on a review of the annual reports from the Medical Quality Registries and their results as posted on the quality results webpage at `www.kvalitetsregistre.no/resultater`, and through the expertise available in the Centre for Clinical Documentation and Evaluation (SKDE), fourteen quality registries were considered as potential candidates for this project. The registries were contacted in spring 2020 with a request for collaboration. The Norwegian Neonatal Medical Quality Registry was unable to join due to their heavy work load. The Norwegian Registry for Gastric Surgery was excluded due to low coverage of the indicators of interest to the project. The twelve registries that wished to join the project were asked to select two or three of their key quality indicators for the project. We held meetings with each registry to discuss potential indicators, and to agree how to organise data collection. The registries supplied data within all relevant indicators, aggregated by age and gender. To describe the specialist areas, we also wanted to show the incidence of diseases and conditions in the population, either as patient rates or treatment rates. Indirect identifiable data from the Norwegian Patient Registry (NPR)[1] and municipal data from statistical records in Statistics Norway (SSB) were mainly used for presentation of these rates. However, the NPR data quality was poor in some specialist areas, and some rate figures therefore take their data from the respective quality registry. The sources are stated in the figures. Following initial analyses of the data, we held meetings with each registry regarding what indicators should be presented in the Atlas. We were keen to select indicators that were important in the specialist area, and which attracted professional consensus. Once a draft had been drawn up for the figures, it became clear that the patient volume was insufficient for some of the indicators, and low volume was a major reason that some indicators were disregarded. A total of thirty-one indicators were chosen for the project.

A draft account of the results and discussion text was prepared by SKDE. The registry directors and advisory boards provided feedback on the drafts and our interpretation and discussion of the results. The text was edited in SKDE and the resulting chapters were once again sent for review. Before publication the Healthcare Atlas was shared with the various registries for information.

2.3 Analyses

2.3.1 Regional Health Authority referral areas

The referral areas in each Regional Health Authority are the geographical catchments that this Healthcare Atlas examines in particular. Results are therefore presented for each referral area. The health authority or hospital has a referral area that spans over certain municipalities or city precincts and zip-codes. This Atlas uses the same general referral areas for specialist health services that are used for emergency medical assistance. Table B.1 in the Appendix shows which referral areas are allocated to the respective health authorities and hospitals, and notes the abbreviated names used for convenience in this Atlas. The table also shows which referral areas belong under which Regional Health Authority (North, West, Central, or South-East RHA). Since not all registries note down details of the city suburbs and zip-codes where Oslo patients live, some of the quality indicators are reported collectively for Oslo as a whole. Where the registries have detailed information, the Oslo results are presented separately for Diakonhjemmet, Lovisenberg and Oslo University Hospital (OUS).

[1] NPR only contains information about publicly financed activity in the specialist health service. SKDE has received indirectly identifiable health data for the years 2014-2019 and the basis for treatment in each case, but these are subject to the privacy regulations, Article 6, no. 1, letter e) and Article 9, no. 2, letter j). SKDE is solely responsible for the analysis, interpretation and presentation of the data supplied from NPR.

2.3.2 Rates and proportions

In order to describe the scope of each specialist sector, the sector specific chapters are introduced with a rate figure showing the number of patients diagnosed (patient rate), and/or numbers of patients treated (treatment rate), per 1,000, 10,000 or 100,000 population, broken down by the respective Regional Health Authority's referral area[2]. In general, the rates are quoted per year, and as an average for the period 2017–2019. Different population compositions in respect of age and gender in the referral areas may result in different sickness levels (morbidity) and different treatment needs. To obtain more comparable referral areas, the rates have been adjusted for age and gender[3]. The results for quality indicators are based on calculations of the proportion of patients in a given patient population who have received treatment that meets a given quality standard. For example, it may be the proportion of patients with a fractured hip who are operated within 48 hours after breaking their hip. For any given referral area, the treatment rate (R) is then calculated as follows:

$$R = \frac{N}{A}$$

Where N (treatment number) is the number of patients with a hip fracture resident in the referral area who were operated within 48 hours, and A (total relevant cases) is the number of patients with a hip fracture resident in the referral area, including those not operated on. For most quality indicators, the report shows the resultant ratios both per year and as an average for the period 2017–2019. For some indicators there were fewer than 10 cases, and the annual variation is therefore omitted from the figures. Moreover, there are also cases where figures are omitted in some years in a referral area, due to reporting failures in certain specialist areas, or because the registry has withheld data on the grounds of privacy in the event of a very small sample. This is explained in the figures and text.

The rates presented in the Results section are not adjusted for variations in age and gender composition. Some of the registries did not provide age and gender statistics for privacy reasons. Unadjusted proportions in all results were chosen on the basis of a desire to use the same method for calculation of results throughout the entire Atlas. For quality indicators where details of age and gender groups were available, the unadjusted proportions were checked against the age and gender adjusted proportions. The comparison showed that adjustment for age and gender has little effect on the results.

2.3.3 Quality target levels

The specialist Advisory Boards that run the national Medical Quality Registries have defined what they believe to be relevant indicators to measure the quality during the treatment process for the disease categories in their registries. These advisory boards have for most quality indicators defined how large a proportion of patients should get the recommended treatment or outcome, which means that target attainment for the quality indicator can be rated as high, moderate or low. The target levels are therefore defined against a backdrop of professional judgement. Usually three target levels are used, but for some quality indicators only two, high and low, are applied. Some indicators do not have any predefined target level. For the 31 indicators chosen for this Healthcare Atlas, there were seventeen with three target levels, seven with two target levels,

[2]This does not apply to section 3.3.2 on diabetes type 1 in adults. It was not possible to obtain correct data for a summary figure on this disease.

[3]Data for the summary figure for vascular surgery had to be supplied from NORKAR. Due to lack of details about age and gender in that data, unadjusted data for vascular surgery is presented.

and seven which, for various reasons, had no predefined target levels. In determining the cut-off levels, allowance has been made for some patients who are clinically unsuited to have the recommended treatment, or who did not wish to attain the desired treatment outcome for reasons that are unconnected with the quality of treatment. High target attainment will therefore be less than 100 per cent.

2.3.4 Evaluation of quality variation

In respect of essential health services offered to patients with a serious condition, it is reasonable to expect that the quality of the examination, treatment or outcome will not vary greatly between referral areas, and that the quality of the services will be the same regardless of where the patients live. The observed variation includes random and systematic variations. When assessing a variation, regard must be paid to the number of patients for which the treatment was relevant. If the number is small, the impact of random variation will be relatively larger. If the numbers are very small, then random variation will be so dominant that it will be impossible to assess whether the observed variation contains a systematic component, or is solely caused by random (unwarranted) variation. In general, the proportion of the total variation due to random events will be less for a larger patient sample, fewer referral areas, and the smaller the differences are between the number of patients for whom the treatment was relevant in the various referral areas. In this Atlas, the results in the referral areas are assessed against the target level of the quality indicators[4]. The primary focus is thus moved from the size of the variation, to the degree of target attainment. In principle, low target attainment may also be due to the novelty of the indicator, since more recent quality indicators will often have a lower target attainment than indicators with a well-established history. Low target attainment can also be due to the target level set for an indicator being overambitious, making attainment of the treatment target very difficult.

We have assumed that it is due to geographical variation when target attainment differs from one referral area to another. Despite the main focus being on the degree of target attainment, namely that it should be high, moderate or low for an indicator in a given referral area, major differences between referral areas within the limits of a target level are also evaluated as an expression of variation of the quality of the treatment. A particularly low target level has a broad range, which means that for some indicators there may be large and relevant differences between referral areas regarding the proportion of patients who achieve the treatment target, even though the referral areas have the same target attainment.

2.3.5 Overall quality

In order to provide an overall survey of the treatment quality in the selected health services, Chapter 4 provides a comparison of the results for 24 of the quality indicators, across all the Healthcare Atlas's twelve specialist sectors, for each referral area. The correlation shows the average results for the period 2017–2019 for all indicators in the Atlas with a defined target level. Target attainment for each indicator is marked in green (high), yellow (moderate), or red (low) in the summary figures. A simplified summary will not include all relevant information, and Chapter 4 must therefore be read in the context of the sector specific chapters. Moreover, some indicators may be perceived as more important than others, which means that low target attainment for certain indicators may be evaluated as more serious than low target attainment for other indicators. We have not performed such evaluations, since the evaluation of importance will depend on one's perspective. The quality indicators in the correlation do not provide a complete picture of the quality in the essential health services. With different quality indicators,

[4] Set by the advisory boards for each registry.

the picture could look different, and the results presented here must therefore be understood as one of several possible approaches to describe the quality of the essential health services. Even though the picture is not complete, SKDE believes that the overall result that is presented in this Atlas is important, relevant, and useful as a pointer to where and to what degree there is geographical variation in quality in the key essential health services.

Chapter 3

Results

3.1 Cardiovascular disease

3.1.1 Heart attack, myocardial infarction

Acute myocardial infarction, also called cardiac infarction or heart attack, is one of the most common serious diseases in Norway. Each year almost 12,000 Norwegians suffer an acute heart attack. Women are 77 years old on average when they suffer a heart attack, whilst the average age for men is 70. Of those suffering the condition, 66 % are men (Norsk hjerteinfarktregister 2020). Most often the disease is due to a narrowing or occlusion (blockage) of one of the coronary arteries, causing blood supply to the heart to be reduced, causing damage to the heart muscle. Myocardial infarction is an acute condition, but the underlying causes are normally long-lasting, due to chronic disease that gradually narrows the artery due to fatty deposits (cholesterol) on the arterial walls. Modern treatments using medications and PCI of the artery can reduce or prevent the heart muscle from suffering severe and permanent injury due to the heart attack (Norsk hjerteinfarktregister 2020).

Heart attacks are categorised in two main types, STEMI and non-STEMI, based on changes in the ECG display during the acute phase of the attack. Acute ST Elevation Myocardial Infarction (STEMI) is due to a coronary artery being completely blocked due to a tear forming in the narrow portion of the artery, and a blood clot forming around it (thrombosis). In these cases, it is vital to open the artery immediately using thrombolysis, which can be done in the patient's home or in the ambulance or at the hospital. The artery can also be opened mechanically using percutaneous coronary intervention (PCI), which requires transporting the patient to a PCI-capable hospital. Most heart attacks, roughly 75 %, do not involve ST elevation, and are called non-STEMI (NSTEMI), meaning that the ECG readings are less pronounced than in STEMI cases, and the coronary artery is not completely occluded in most cases. For patients with non-STEMI, early examination is recommended to determine whether PCI or cardiac surgery is indicated.

Figure 3.1 shows the annual number of patients who received treatment for heart attack per 1,000 population (patient rate), broken down by referral area during the period 2017–2019. The patient rate was roughly twice as high for residents in the Finnmark referral area as for residents of Sørlandet. The figure also shows that the patient rate decreased from 2017–2019. The reasons for the large contrasts in patient rates have not been fully explained, but the differences probably correlate with the risk factors for heart attack, namely smoking, cholesterol, and so on, being differently spread among the population, and the different coding practices at different hospitals.

There is no reason to suspect that the differences are due to different medical practices when it comes to admitting patients with myocardial infarction into hospital.

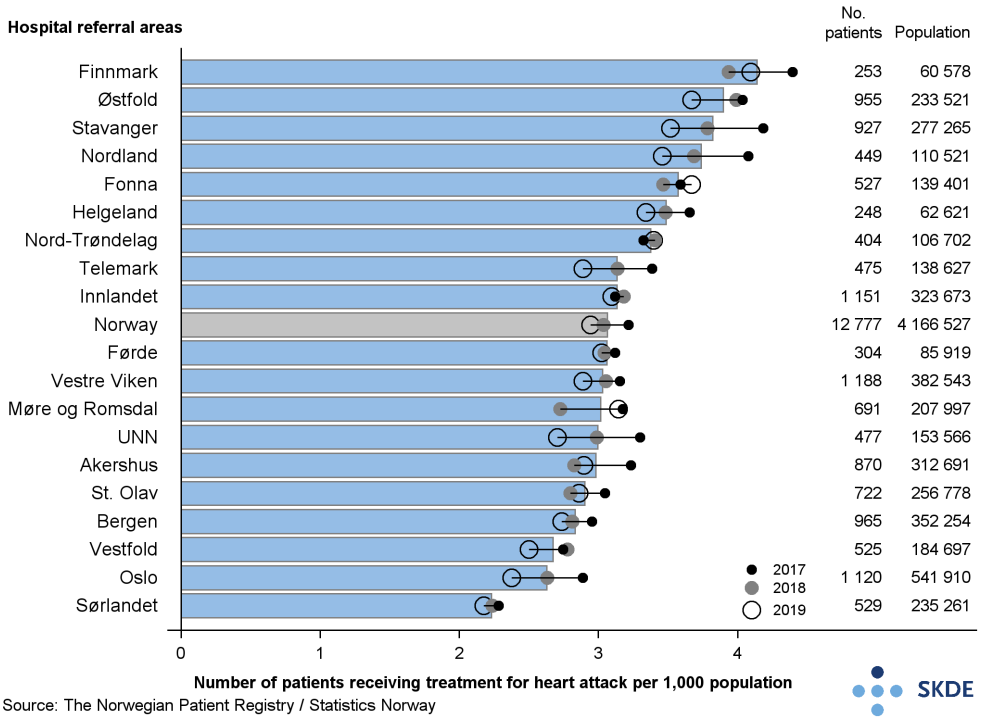

Figure 3.1: Number of patients receiving treatment for heart attack per 1,000 population, adjusted for age and gender, broken down by referral area. Bars show average rates; annual rates are shown by symbol. Figures on the right show the number of patients and size of population. Average per year in period 2017–2019.

Results

The Norwegian Cardiovascular Disease Registry supplied the data in this chapter, and in consultation with the Registry, the following indicators were defined to illuminate the quality of the essential health services: *reperfusion therapy within recommended time in case of STEMI*, and *proportion of patients with non-STEMI receiving invasive examination within 72 hours*. The Registry is supported 100 % by relevant hospitals, and the coverage ratio was more than 90 % during the period 2017–2019.

Reperfusion therapy within recommended time in case of STEMI

In case of STEMI, the occluded artery should be opened as fast as possible, to reduce the risk of permanent injury to the heart musculature, which can lead to heart failure and death. Thrombolysis can be given pre-hospital, whilst PCI can only be performed at PCI-capable university hospitals and Sørlandet Hospital in Arendal. PCI is preferred if you can expect the artery to be opened within 90-120 minutes after diagnosis. In practice, this means that the transport time from the diagnosis location to the PCI-capable hospital must be less than 60 minutes. Due to large distances, many patients cannot reach the PCI-capable hospital in time. Such patients should be given thrombolysis, pre-hospital or in the local hospital. These are assessments that the first hospital in the treatment chain must make, if necessary in consultation with the PCI duty physician at the PCI-capable hospital, to determine whether the patient will

receive thrombolysis or be transported to the PCI-capable hospital. The indicator reperfusion therapy within recommended time in case of STEMI shows the proportion of patients of age 18-84 admitted with STEMI, who waited less than 12 hours from the onset of symptoms to the first medical contact (FMC), who were treated by thrombolysis within 30 minutes, or by PCI within 120 minutes after FMC. High target attainment has been set by the Registry Advisory Board at minimum 85 % of STEMI patients within the recommended time for reperfusion therapy. Moderate and low attainment is given as 70-84 % and below 70 %, respectively.

Figure 3.2 shows that roughly 62 % of patients received treatment to open the occluded artery within the recommended time in the period 2017–2019. There was geographical variation in target attainment for this indicator. None of the referral areas achieved high attainment, based on the average results in the period. Nevertheless, Vestfold, as the only referral area, achieved high target attainment for one of the years in the period (2019). Of the 19 referral areas, there were 8 that achieved moderate target attainment in the period 2017–2019. For the remaining referral areas, target attainment was low.

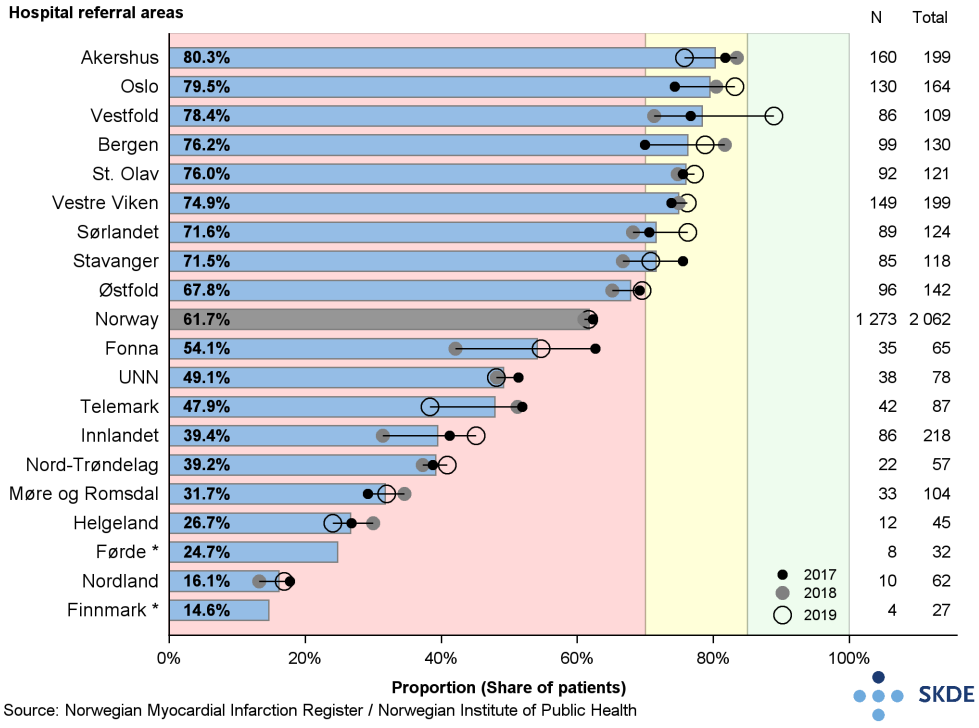

Figure 3.2: Heart attack. Showing proportion of patients with STEMI who received reperfusion therapy within recommended time, broken down by referral area. Age 18-84 years. Bars show average proportions; annual proportions are shown by symbol. The numbers to the right of the figure show the number of patients who received reperfusion therapy within the recommended time (N), and the number of patients who were relevant for reperfusion therapy (total relevant cases). Average per year in period 2017–2019. *Referral area has less than 10 cases on average per year.

There were major differences between the referral areas for the proportion of patients who received reperfusion therapy within the recommended time. On average, 80 % of patients resident in Akershus referral area received reperfusion therapy in time, compared with 15 % of patients in Finnmark. For many referral areas, there was no improvement in the proportion of patients receiving reperfusion therapy within the recommended time in the period 2017–2019. As is seen from Figure 3.2, the numbers were small for some referral areas, meaning that interpretation of

the results there is fraught with uncertainty.

At the regional level, target attainment was low, and the proportion of patients receiving reperfusion therapy within the recommended time varied among the various regions. Health South-East RHA returned the best results, on average 67 % of patients resident in this region received reperfusion therapy within the recommended time, compared with 32 % of patients resident in Health North RHA. The corresponding figures for Health Central RHA and Health West RHA were 52 % and 65 %, respectively.

Proportion of patients with non-STEMI undergoing invasive procedures within 72 hours

European guidelines recommend that non-STEMI patients as a rule should be examined using invasive procedures in the form of coronary angiography, which is radiography of the coronary arteries, within 24 hours after admission to hospital (Norsk hjerteinfarktregister 2020). Just like cardiologists in other countries, the Registry Advisory Board in Norway has concluded that there is no sound documentation that these patients should be examined within 24 hours, and this quality indicator therefore measures the invasive procedures within 72 hours (Norsk hjerteinfarktregister 2020).

High target attainment for this indicator has been set by the Advisory Board at invasive procedures within 72 hours for minimum 80 % of non-STEMI patients. Moderate attainment is given as 50-79 % and low attainment as below 50 %.

The results are presented for patients age 18-84 years.

Figure 3.3 shows that none of the referral areas reported high target attainment for the quality indicator *proportion of patients with non-STEMI undergoing invasive procedures within 72 hours*, based on an overall result for the period 2017–2019. Most referral areas had moderate attainment, and 2 referral areas had low attainment. There are major differences between referral areas in the proportion of patients with non-STEMI who undergoing invasive procedures within 72 hours after admission.

Average result for period 2017–2019 shows that the proportion of patients who reached the treatment target was highest in referral areas Sørlandet and UNN, as just below 80 % of patients resident in these referral areas underwent invasive procedures within 72 hours. Both UNN and Sørlandet achieved high target attainment for this indicator in 2019. The proportion of patients achieving the treatment target was lowest in referral areas Møre og Romsdal, and Stavanger, where roughly 45 % of patients were examined within the recommended time.

In regional terms, target attainment was moderate, and there was variation between the regions regarding the proportion of patients with non-STEMI undergoing invasive procedures within 72 hours. The proportion of patients achieving the treatment target was highest in Health North RHA, where an average of 67 % of patients resident in the region undergoing invasive procedures within 72 hours, compared with 54 % of patients resident in Health Central RHA. Nationally, the proportion of patients with non-STEMI who were examined within 72 hours rose from about 60 % in 2017 to about 63 % in 2019.

Discussion of results

Different referral areas returned high and low target attainment for the two indicators presented in this chapter, and therefore it looks as if there were different challenges for examination and treatment of patients with a heart attack in the different referral areas.

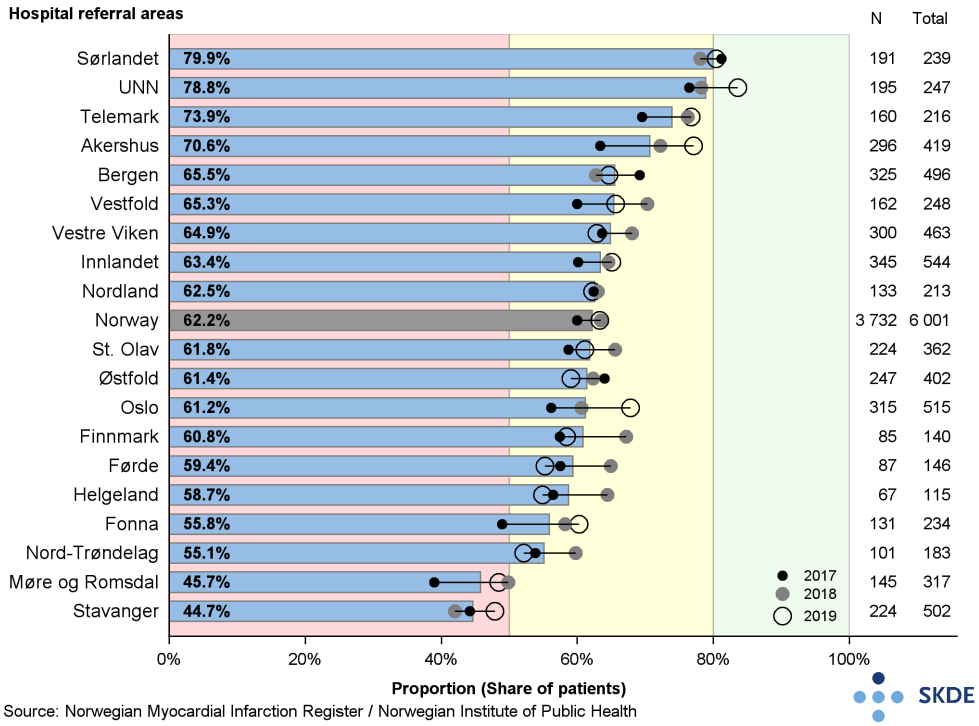

Figure 3.3: Heart attack. Proportion of patients with non-STEMI undergoing invasive procedures within 72 hours after admission, broken down by referral area. Age 18-84 years. The bars show average proportions; annual proportions are shown by symbol. The numbers to the right show the number of patients with non-STEMI who undergoing invasive procedures within 72 hours (N), and the number of patients with non-STEMI who were relevant for invasive procedures (total relevant cases). Average per year in the period 2017–2019.

Nationally, the target for reperfusion therapy was not met within the recommended time in 38 % of patients. Rapid opening of the occluded artery will often be the single most important measure in the acute phase of a heart attack. The fact that many patients did not have their occluded artery opened quickly enough, and the large geographical variation shown by the results, suggests that there were quality challenges in this part of the treatment of heart attack. One familiar cause why reperfusion therapy was not given within the recommended time, is underestimation of the time it takes to transport the patient to a PCI-capable hospital (Norsk hjerteinfarktregister 2020). Therefore, it is vital to assess clinical pathways where the patient is transported with PCI in mind, but did not get treatment within 120 minutes, because these patients should have been given thrombolysis therapy. Thrombolysis therapy is a treatment alternative that can be given pre-hospital in the patient's home or in the ambulance, or in a local hospital. The results suggest that thrombolysis should be utilised far more often in cases of STEMI heart attack.

All regions had low target attainment for the quality indicator *reperfusion therapy within recommended time for STEMI*, and Health North RHA had a significantly lower proportion of patients who were treated by reperfusion therapy within the recommended time, than other regions. UNN Tromsø was formerly the only hospital with PCI-capable emergency capacity in Health North RHA. The Nordland Hospital commissioned a PCI centre in 2020, but the treatment was given at UNN Tromsø in the period 2017–2019. Therefore, there were many patients who had a long journey to a PCI-capable hospital in Health North RHA, and treatment by thrombolysis was therefore relevant for many of the patients in this region. The results suggest that the availability

of thrombolysis for STEMI patients should be improved, both in Health North RHA and in the other regions.

The average result for the period 2017–2019 shows that 38 % of patients with non-STEMI were examined by radiography of the coronary arteries later than 72 hours after admission. Many patients must be transferred from the local hospital to another treatment centre for this examination, and the delay may be due to patient factors, transport factors, or local treatment traditions. There is no evidence of a prognosis benefit for patients due to early examination, and therefore it is conceivable that the need for this type of examination has been assessed differently by different specialists. There are also patients who do not want this examination. Even though patients have no clear benefit from early examination, the length of the hospital stay can be reduced somewhat, and in several regions, work is going on so that a larger proportion of patients are examined within 72 hours.

3.1.2 Vascular surgery

Vascular surgery is an intervention designed to treat diseases and injury to blood vessels other than in the heart and head. This type of surgery is used in particular for dilated arteries (aneurisms), and for reduced blood flow to the legs (arteriosclerosis). Among its benefits, vascular surgery can improve blood flow to areas that are being starved of blood, since the surgeon removes the plaque from the inside of the blood vessel, inserts a new blood vessel to bypass the blood stream around the occluded area (bypass operation), inserts a balloon catheter to dilate the artery or inserts a cylindrical tube (stent) to keep the artery open. Each hear around 6100 vascular surgeries are performed in Norway, of which 3400 are to improve blood flow to the legs, and around 500 are to treat narrowing of the carotid artery.

Reduced blood flow to the legs

Reduced blood flow to the legs is a condition that affects the elderly first and foremost. In 2019, the median age at time of treatment was 73 years, and 61 % of patients were male (Norsk karkirurgisk register 2020). Smoking is a key cause of reduced blood circulation in the legs, and the condition has a popular name ”smoker’s leg”. There are well-known geographical differences in the prevalence of smokers in Norway (Folkehelseinstituttet 2020), which is a likely cause of some of the variation in the rates reported in Figure 3.4.

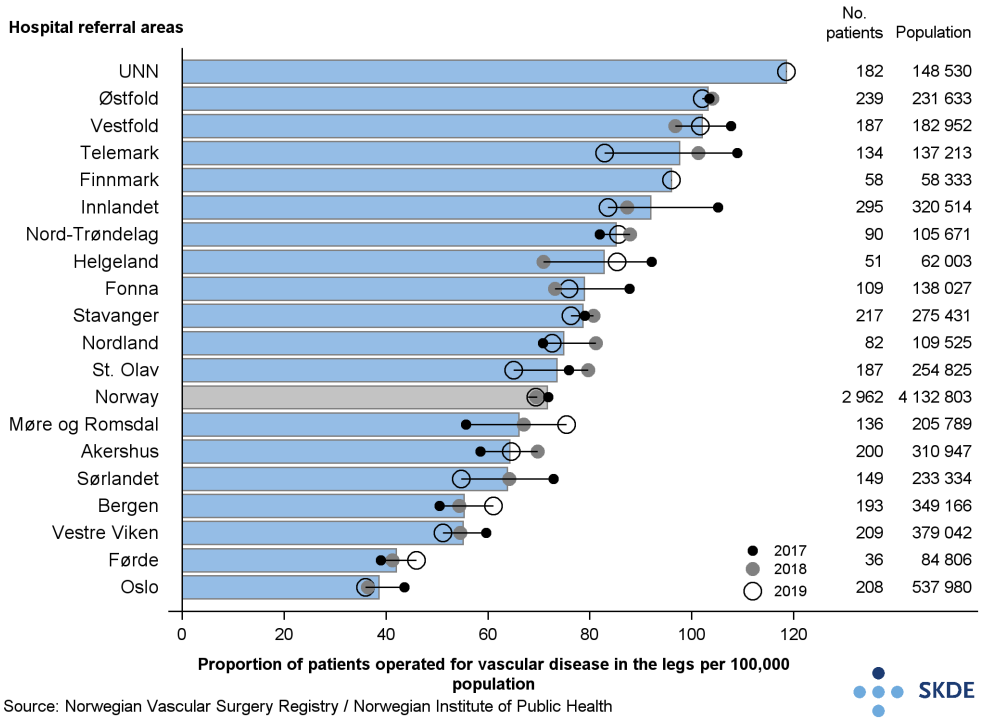

Figure 3.4: Proportion of patients operated for vascular disease in the legs per 100,000 population, unadjusted, broken down by referral area. Bars show the average rates; annual rates are shown by symbol. The figures on the right show the number of patients and number of population. Average per year in period 2017–2019.

The consequences of reduced blood flow to the legs are reduced supply of nutrition and oxygen. In the worst-case scenario this may result in the leg needing amputation, or the patient dying. Roughly 95 % of all vascular surgical interventions in the leg are due to reduced blood supply,

whilst the remaining interventions are due to dilated blood vessels (Norsk karkirurgisk register 2020). The first symptoms of failing blood circulation are claudication, which manifests as walking pain that does not threaten the leg. In more severe cases, leg pain at night when resting, also sores and gangrene, or acute limb ischemia (acute critically depressed blood supply) occur.

Results

The Norwegian Cardiovascular Disease Registry (NORKAR) has supplied the data for this chapter. In consultation with the Registry, the indicators *proportion of operations for claudication* and *proportion of patients with narrowing of the carotid artery treated within 14 days* were chosen to illustrate the quality of the essential health services. The Registry was backed 100 % by hospitals for units offering vascular surgery in 2019, with 17 units affiliated with NORKAR. The coverage ratio for vascular surgery of the legs has increased in recent years, from 86 % in 2017 to 89 % in 2019.

Proportion of operations for claudication

Claudication is treated preferably by exercise, changes in diet, and quitting smoking, perhaps in combination with medications. Structured, guided exercise is recommended for all patients with claudication, but there are few offerings of this in Norway, as it has been insufficiently developed (Norsk karkirurgisk register 2020). A greater focus on exercise treatment is important, both before and after operational intervention for claudication, and would in time help give a more comprehensive service to patients suffering from the condition, regardless of place of residence.

If conservative treatment is insufficient, the condition can be treated surgically by an operation aiming to improve blood circulation to the leg. There are a variety of thresholds for when a patient is offered claudication surgery. The patient's legs are not under threat from claudication, and therefore the option to avoid surgery is greater, and instead wait and see how the condition develops.

Data reported by patients to the Registry show that patients with claudication who are operated on, find an improvement in their quality of life (Norsk karkirurgisk register 2020). On the other hand, the response rate from the survey was low, and there is therefore uncertainty in the results. Both the patient's perception of the operation and the conservative therapy, and the causes of the differences in proportion of patients operated due to claudication, could usefully be investigated further.

The results presented here show how large a proportion of surgical treatment of reduced blood supply to the legs was performed in response to an indication of claudication. The Registry has not defined any target levels for the quality indicator.

Figure 3.5 shows geographical variation in how large a proportion of vascular surgery in the legs was performed on an indication of claudication. The referral area Stavanger had the highest proportion of operations on an indication of claudication, with 79.1 % of vascular surgical procedures for reduced blood supply in legs in this referral area being done on the indication of claudication. Referral areas Fonna, Helgeland and Finnmark were others in which there was a high rate of claudication referrals. On average, between 68.5 % and 75.8 % of patients resident in these referral areas were operated in response to an indication of claudication. The proportion was lowest in referral areas Oslo, Akershus and St Olav, where between 44.2 % and 46.9 % of patients who were operated for reduced blood supply to the legs were diagnosed with claudication. The annual trends for residents in Oslo and Akershus show a reduction in proportion of patients being operated for claudication in the period 2017-2019. In Oslo, the proportion decreased from 50.4

% in 2017 to 41.4 % in 2019. Corresponding figures for Akershus were 53.7 % and 39.7 %, respectively. Regionally, the proportion of operations for reduced blood flow to the legs due to an indication of claudication was between 67 % in Health West RHA and roughly 53 % in Health South-East RHA.

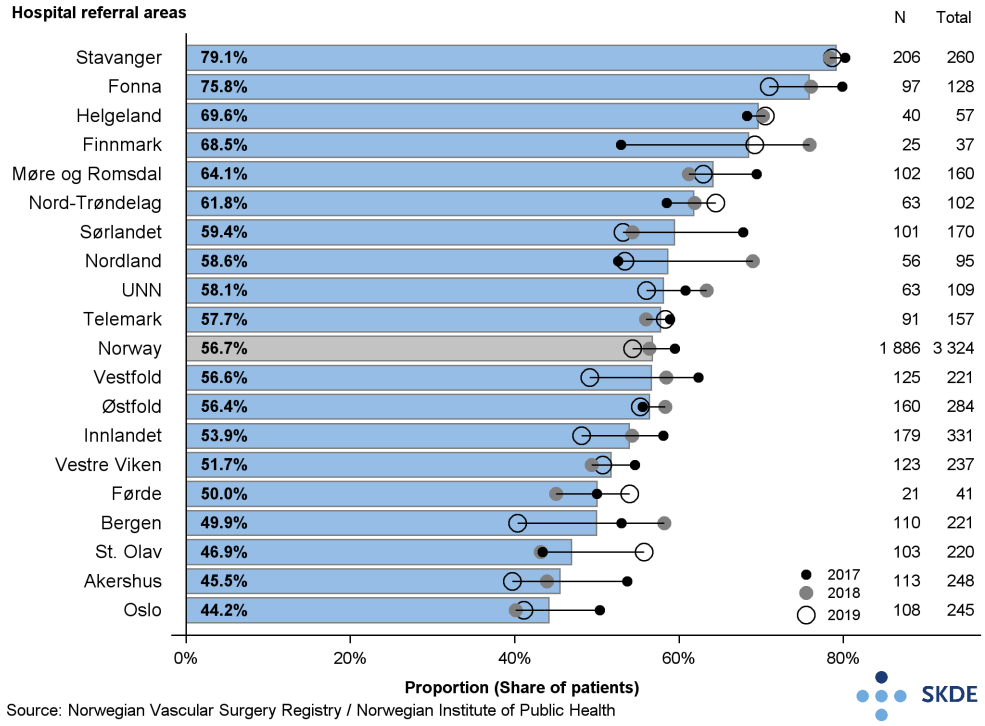

Figure 3.5: Vascular surgery. Proportion of operations for reduced blood flow in legs due to indication of claudication, broken down by referral area. Bars show average proportions; annual proportions shown by symbol. Figures on the right show the number of operations due to an indication of claudication (N) and the number of operations for reduced blood flow in the legs (total relevant cases). Average for the year in the period 2017-2019.

The national average for the period shows that roughly 57 % of those operated for reduced blood flow in the legs were diagnosed with claudication. That means the remaining 43 % were either suffering from resting pains, sores or gangrene, or acute ischemia as the reason for their leg surgery. There was a weakly declining trend in the proportion of patients operated for claudication. In the period 2017-2019 the proportion declined from 59.5 % to 54.3 %.

Narrowing of carotid artery

Narrowing of the carotid artery, also called carotid stenosis, is caused by the build-up of fat and plaque inside the artery wall (atherosclerosis). This reduces the blood flow in the blood vessel, leading to an increased risk of blood clots forming and being transported to the brain (Norsk karkirurgisk register 2020).

A distinction is made between symptomatic carotid stenosis, where the narrowing of the carotid artery has caused a transient ischemic attack (TIA) of reduced blood flow to the brain, or stroke, and asymptomatic carotid stenosis, where there is a narrowing of the carotid artery but no symptoms. The median age for time of diagnosis of carotid stenosis was 73 years in 2019, and roughly 68 % of those affected by the condition in that year were men (Norsk karkirurgisk register 2020).

Due to the small number of patients each year, annual variation is not shown in Figure 3.6, and the number of patients in the right-hand column is the total number for the 3-year period 2017-2019. Figure 3.6 shows that there was geographical variation in operation rates for carotid stenosis. For the period 2017-2019, the average rate varied from 6 to 20 operations per 100,000 population in Akershus and Telemark referral areas, respectively. The national operation rate was relatively stable at 11 per 100,000 population in all 3 years.

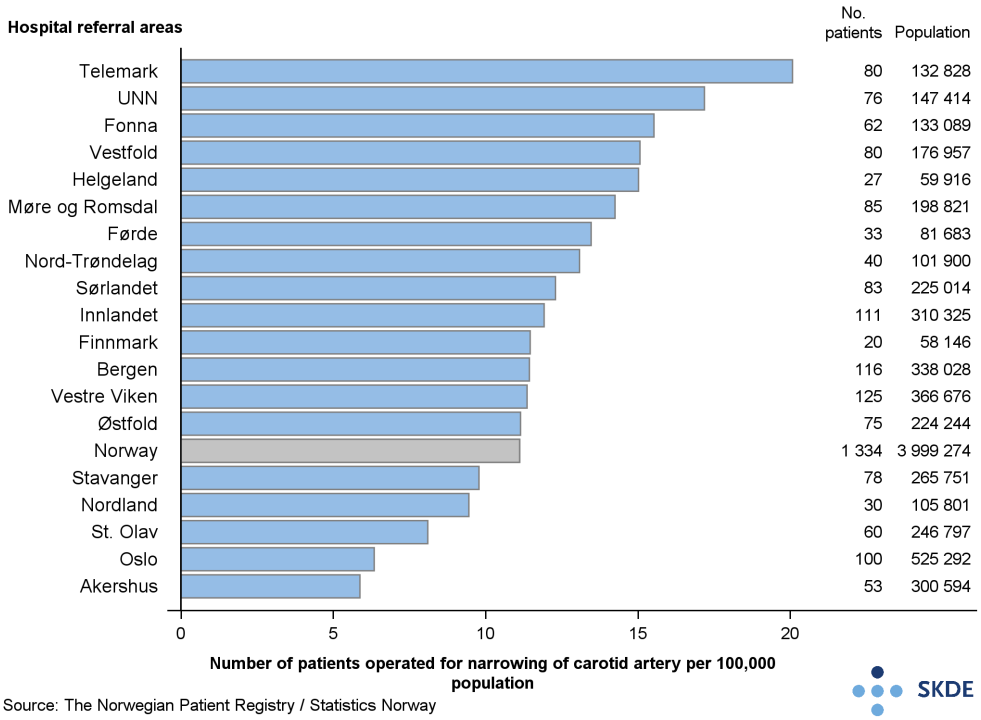

Figure 3.6: Number of patients operated for narrowing of the carotid artery per 100,000 population, adjusted for age and gender, broken down by referral area. Bars show average rates. Figures on right show total number of patients in 3-year period 2017-2019, and average population during the period 2017-2019.

Results

The coverage rate for carotid stenosis was over 90 % in the period 2017-2019, according to the Norwegian Cardiovascular Disease Registry (NORKAR). Few patients, roughly 450 per year, are operated for carotid stenosis. Therefore, the results are presented as an average for the period 2017-2019.

Proportion of patients treated within 14 days

Roughly 90 % of patients operated for carotid stenosis have already suffered from TIA or stroke (Norsk karkirurgisk register 2020). Patients are operated for carotid stenosis to prevent further stroke, and the intervention should therefore be done as soon as possible, and preferably within 14 days after the stenosis is detected, according to the national guidelines (Norsk karkirurgisk register 2020). High target attainment for the quality indicator *proportion of patients with carotid stenosis treated within 14 days* has been set by the Registry Advisory Board to be minimum 80 % of patients within 14 days for high attainment. Moderate and low attainment are given as 60-80

% and below 60 %, respectively. The results presented here are for patients with symptomatic carotid stenosis.

Figure 3.7 shows that there was geographical variation in target attainment for the quality indicator *proportion of patients with symptomatic carotid stenosis treated within 14 days* in the period 2017-2019. Of the 19 referral areas, 9 achieved high target attainment, 9 had moderate target attainment, and 1 had low target attainment. The proportion treated within 14 days was highest in referral area UNN, and lowest in referral area Bergen. Respectively 92.9 % and 50.0 % of patients resident in these referral areas were treated within 14 days.

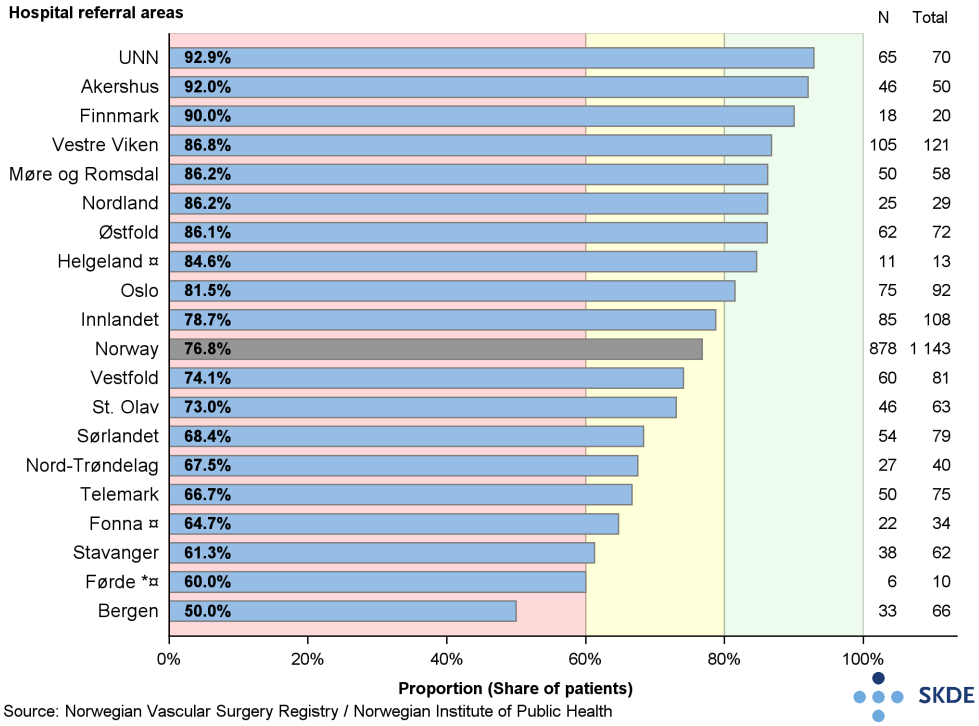

Figure 3.7: Vascular surgery. Proportion of patients with symptomatic carotid stenosis operated within 14 days, broken down by referral area. Bars show the average proportions. Figures on the right show the number of patients operated within 14 days (N) and the number of patients with symptomatic carotid stenosis (total relevant cases). Showing total number in the 3-year period 2017-2019. *Proportion is calculated using N<10. ¤ The referral area lacks data for one or several years.

In regional terms, there are significant variations. Target attainment was high in Health North RHA, with roughly 90 % of patients resident there being treated within 14 days, compared with roughly 58 % of patients resident in Health West RHA, which returned a low target attainment for this indicator. In Health Central RHA and Health South-East RHA the target attainment was moderate in the period, at 76 % and 79 %, respectively, of the patients resident in these areas being treated for symptomatic carotid stenosis within 14 days.

Nationally the target attainment was moderate in the period 2017-2019, given that on average 76.8 % of patients with symptomatic carotid stenosis were treated within 14 days.

Discussion of results

The variation in number of patients operated for vascular disease in the legs was unexpectedly large, and there is reason to ask why clinical practices are so different. Smoking over time is an important and well documented cause of vascular disease in the legs[5], and there are well-recognised geographical differences in the proportion of smokers in Norway. The occurrence of lung cancer is closely correlated with smoking and can be used as an indirect measure of long-term smoking in the referral areas, see Healthcare Atlas for COPD (Leivseth et al. 2017).

A comparison of Figure 3.4 showing the rates for operation for vascular disease in the legs, and Figure 3.23 in Section 3.2.3, showing occurrence of lung cancer, on the other hand, shows that several of the referral areas with the highest rates of lung cancer did not have the highest rates of operations for vascular disease in the legs. This suggest that differences in sickness (morbidity) cannot explain all the variations in Figure 3.4, and therefore there must be further causes of this variation.

Figure 3.5 showed that the proportion of operations for reduced blood supply to the legs, performed on the basis of a claudication diagnosis, varied among referral areas. An immediate conclusion can be that the variation is due to referral areas with a low proportion of operations for claudication operated on a larger proportion of patients with more severely reduced blood flow to the legs. However, it has not been established how large a proportion of patients with claudication who should be operated, and there may also be other different causes why the proportion of operated patients with claudication varied. Possible explanations for the variation can be varying clinical practices, different coding practice, different hospital capacities, or different thresholds for how long patients waited to consult healthcare professionals. If a patient has depressed blood flow to the legs, with no threat to the legs, then it is possible to delay operation. At the same time, this entails a risk that the condition will progress and become more severe. It is possible that some surgeons chose to treat their patients earlier than others, and that this is the reason for the variation shown in the analysis. Yet it is difficult to say whether it is desirable to operate patients early or not, which means it is quite a challenge to interpret the results.

Patients with symptomatic carotid stenosis are at risk of suffering a new stroke, and therefore it is vital that treatment is initiated quickly. The results for the quality indicator *proportion treated for narrowing of the carotid artery within 14 days* showed that the referral areas achieved different target attainment for this indicator. To clarify the reasons for the delayed treatment, the Norwegian Cardiovascular Disease Registry has collaborated with treatment hospitals to review the clinical pathways from 2018 to 2019, where the operation for carotid stenosis was not performed within the recommended time. There were 10 hospitals involved in the review, and for 120 of 179 patients, the cause of the delay could be identified.

The review showed that the surgeon or healthcare service was responsible for the delay in something less than half of cases. Waiting times for outpatient assessment, waiting times for the operation, and late referral from the general practitioner to the specialist were some of the causes of the delays. In roughly 20 % of cases where the patient was treated later than recommended, there was a medical reason for the delay, and in rather more than 20 % of cases the patient was personally responsible for the delay (Norsk karkirurgisk register 2020). This sort of analysis of causes of delays gives the health authorities an insight as to what parts of the clinical pathway could usefully be improved to achieve a higher target attainment for this quality indicator.

[5]Reference: *Helsenorge – helseskader ved røyking* (National online health services in Norway - Health damage due to smoking), www.helsenorge.no

3.1.3 Stroke

Each year roughly 10,000 persons are admitted to Norwegian hospitals with a stroke. A blood clot in the cerebral arteries is the primary cause of most cases of stroke (85 %), but a few patients also suffer a stroke as the result of cerebral hemorrhage (10-15 %) (Norsk hjerneslagregister 2020). Both a blood clot and cerebral hemorrhage cause an area of the brain to get insufficient oxygen, so that brain cells die. Stroke is one of our most serious popular diseases, and among the most frequent causes of death and functional impairment. How a person is affected by a stroke will depend on the precise area in the brain that is damaged, and how serious the hemorrhage or blood clotting was. Common symptoms of stroke are paralysis of one side of the body or face, and speech slurring, as is also explained in the Directorate of Health's FAST Information Campaign (Facial droop, Arm weak, Speech difficult, Time to call emergency).

Age-related occurrence of stroke is decreasing, but an increasing proportion of elderly people in the general population means we anticipate an increase in the numbers of stroke victims in the coming years (Norsk hjerneslagregister 2020). Even so, there has been a significant reduction in mortality due to stroke in the last decade (40 %), and this reduction in mortality is expected to lead to a large increase in the number of individuals who will be living with large or small consequences of a stroke (Norsk hjerneslagregister 2020). This will represent a challenge for both the individual patient, for the relatives, for the healthcare service and for the community as a whole. Therefore, it is vital that treatment and follow-up of this large and increasing group of patients are ensured.

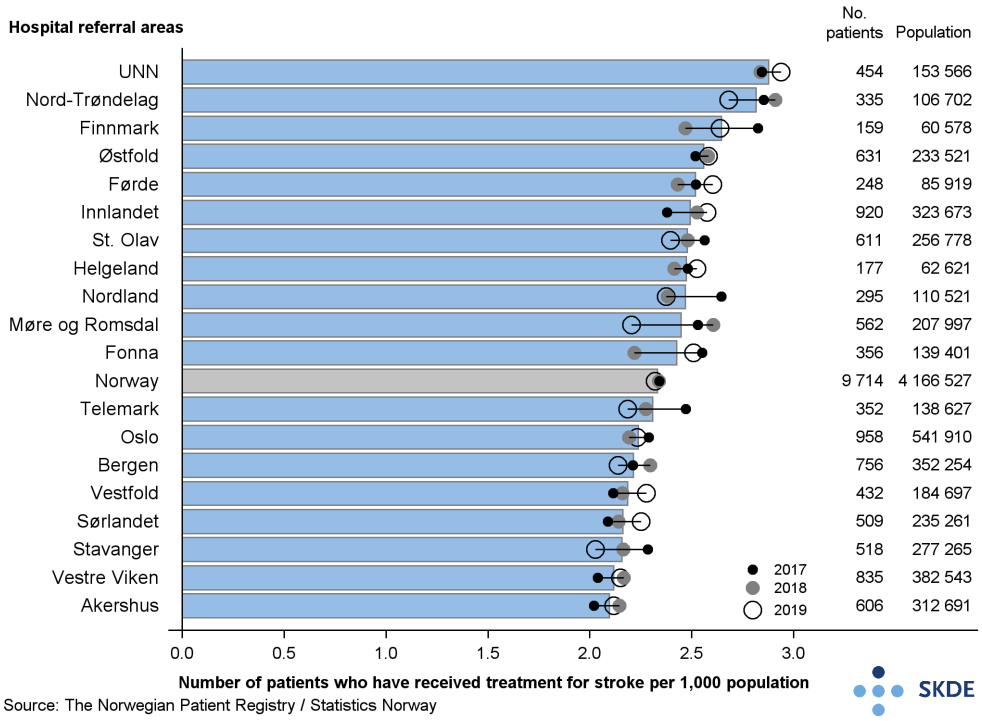

Figure 3.8: Number of patients who have received treatment for stroke per 1,000 population, adjusted for age and gender, broken down by referral area. Bars show average rates; annual rates are shown by symbol. Numbers to the right show the number of patients and number of population. Average per year in period 2017-2019.

Figure 3.8 shows the annual number of persons who received treatment for stroke per 1,000 population (patient rate), broken down by referral area in the period 2017-2019. The patient rate varied from roughly 2.8 patients per 1,000 population in the UNN and Nord-Trøndelag referral areas, to just over 2 patients per 1,000 population for the Vestre Viken and Akershus referral areas.

Results

The Norwegian Stroke Registry (NHR) has provided data for this chapter, and in consultation with the Registry the indicators *proportion of patients with stroke who were treated by thrombolysis* and *proportion of patients with stroke who were admitted within 4 hours* were chosen to illustrate the quality of essential health services. Support for the Norwegian Stroke Registry was 100 % for the entire period, and the coverage rate was stable at around 87 %.

Proportion of patients with stroke (blood clot in brain) who were treated by thrombolysis

It has been shown that if thrombolysis treatment is started on patients suffering an acute stroke within 4.5 hours after the onset of symptoms, the functional impairment that results can be mitigated (Sandercock et al. 2012). This is also the primary recommendation in the National Guideline for Treatment and Rehabilitation of Stroke Patients (Helsedirektoratet 2017).

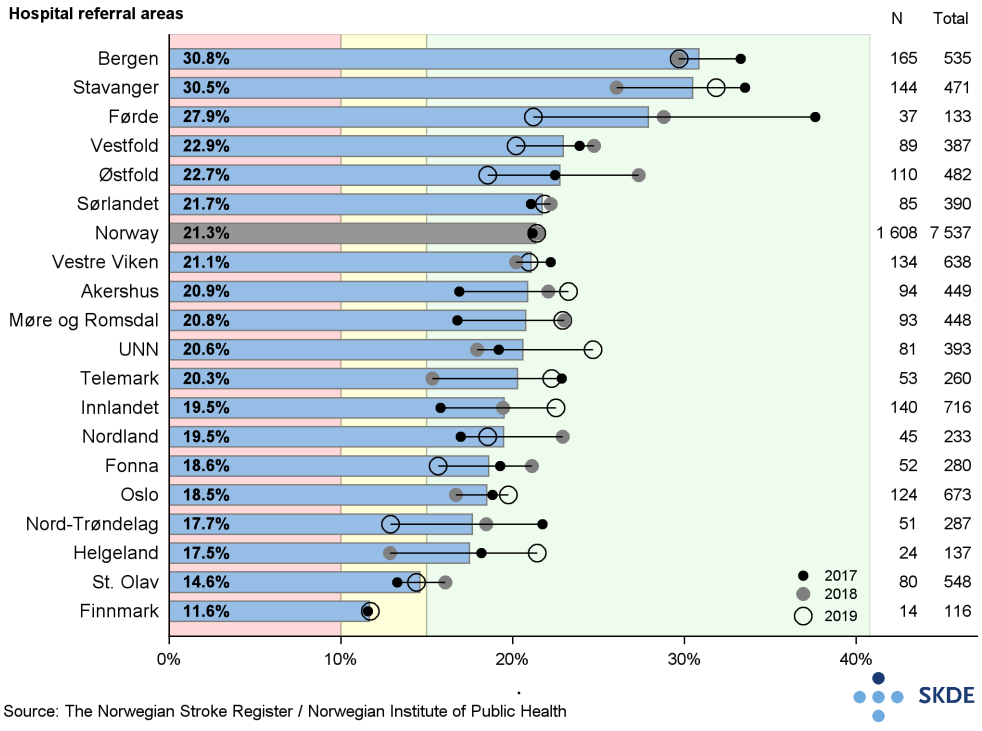

Figure 3.9: Stroke. Proportion of patients with stroke treated by thrombolysis, broken down by referral area. Bars show average proportions; annual proportions shown by symbol. Figures on right of figure show number of patients with stroke treated by thrombolysis (N) and number of patients with stroke (total relevant cases). Average per year in period 2017-2019.

Nevertheless, the knowledge available in this special field is still insufficient to decide how large a proportion of patients with stroke should be treated using thrombolysis, since the

benefit of thrombolysis therapy with very light stroke symptoms is unclear, and because thrombolysis therapy involves a risk of severe side-effects, including cerebral hemorrhage (Norsk hjerneslagregister 2020). Therefore, it is not the case that good treatment quality entails that the largest possible proportion of patients should be given thrombolysis therapy. Indications of thrombolysis will depend on how severe the stroke is, how long time has passed from the onset of symptoms until treatment can commence, and an assessment of the risk of severe side-effects.

High target attainment for the quality indicator *proportion of patients treated with thrombolysis* has been set by the Registry Advisory Board as treatment with thrombolysis for minimum 15 % of patients with stroke. Moderate and low attainment is given as 10-15 % and below 10 %, respectively.

Figure 3.9 shows that 17 of 19 referral areas reported high target attainment for the quality indicator *proportion of patients with stroke who were treated with thrombolysis* in the period 2017-2019, and that 2 of the referral areas had moderate attainment. There was variation among the referral areas regarding how large a proportion of patients with stroke were treated with thrombolysis, and in many referral areas the proportion of patients treated with thrombolysis was far higher than 15 %. Referral areas Bergen and Stavanger had the highest proportion of patients treated with thrombolysis in the period, with roughly 30 % of patients with stroke who were resident in these referral areas being treated with thrombolysis, compared with 11 % in Finnmark, which was the referral area with the lowest proportion of thrombolysis. For referral area Finnmark, data is lacking for 2018, and the average for this referral area is therefore based on the results for 2017 and 2019. The low number of patients in Finnmark means moreover that interpretation of the results for this referral area is fraught with uncertainty. However, the results show that also larger referral areas than Finnmark, like Nord-Trøndelag and Oslo, had a significantly lower proportion of thrombolysis than referral areas Bergen and Stavanger.

At the regional level, target attainment was high for all regions, although at the same time there was considerable difference between regions regarding how large a proportion of patients was treated with thrombolysis. On average, 17 % of patients resident in Health Central RHA were treated with thrombolysis, compared with 28 % in Health West RHA. At the national level, the proportion of patients who were treated by thrombolysis was stable at 21 % during the period.

Proportion of stroke patients who are admitted within 4 hours

There is reliable documentation that thrombolysis has the greatest effect if given soon after the onset of symptoms, and national guidelines recommend that patients who are relevant for thrombolysis therapy should be examined as quickly as possible to ensure early treatment (Norsk hjerneslagregister 2020). The specialist health service can ensure rapid examination and treatment immediately on arrival of the patient at the emergency room when a stroke is suspected, but if the patient is admitted long after the stroke, that may be a reason why thrombolysis is not attempted that is not due to poor quality of treatment by the specialist health service. This indicator was chosen to illuminate whether there may be a correlation between late arrival at the hospital and target attainment for the quality indicator *proportion of patients with stroke who were treated with thrombolysis*.

The Norwegian Stroke Registry has not defined the target level for this indicator, but in the Clinical Pathway - Stroke Phase 1" the time from onset of symptoms until admission is a milestone. The Registry cites a target of 60 % of patients with stroke being admitted within 4 hours of onset of symptoms.

Figure 3.10 shows that more than half of patients in Norway were admitted later than 4 hours

after the onset of symptoms, based on the overall results in the period. The proportion of patients admitted within 4 hours was highest for patients resident in referral area Stavanger. Of the patients in this referral area, 54 % were admitted to hospital within 4 hours, compared with about 38 % of patients resident in referral areas St Olav and Finnmark, which had the lowest proportion.

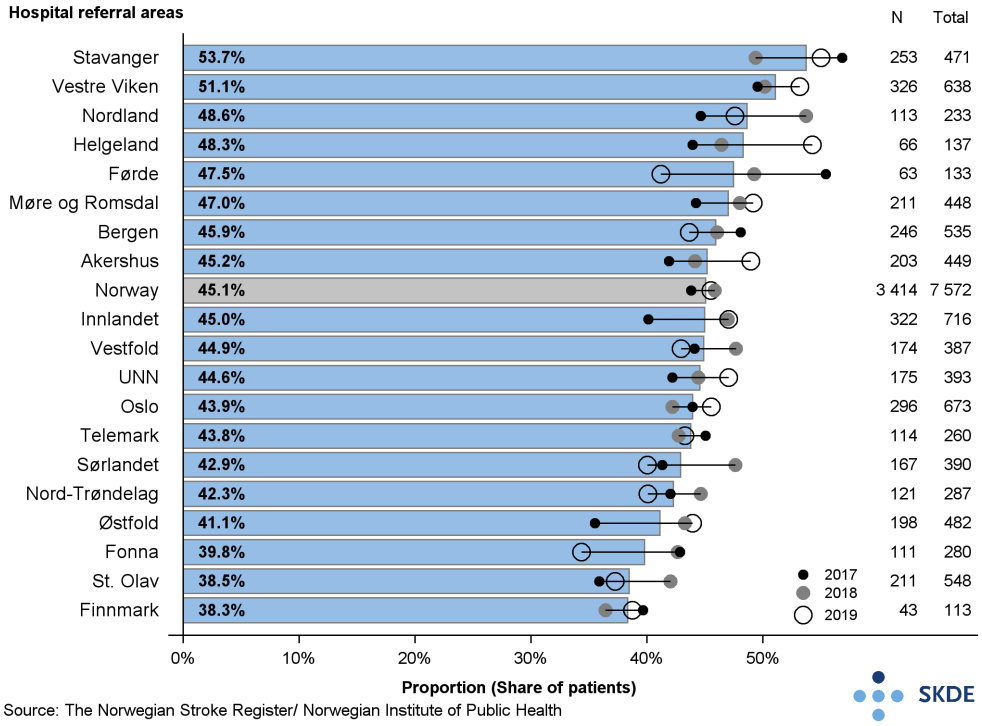

Figure 3.10: Stroke. Proportion of patients admitted within 4 hours after stroke, broken down by referral area. Bars show the average proportion, annual proportions are shown by symbol. The numbers to the right show the number of patients with stroke who were admitted within 4 hours (N) and the number of patients with stroke (total relevant cases). Average per year in period 2017-2019.

There were no great differences among regions. Of patients in Health West RHA, 47 % were admitted within 4 hours, compared with 42 % of patients in Health Central RHA. Nationally, there was no clear trend for more patients to be admitted within 4 hours during the period. Regionally, the proportion of patients admitted within 4 hours was 2-3 percentage points higher in 2019 than in 2017 for all regions, except Health West RHA where the figure was 4 percentage points lower in 2019 than in 2017.

Discussion of results

In the period 2017-2019 there were great variations in the proportion of patients with acute stroke who were treated with thrombolysis in the various referral areas. For some referral areas, there seemed to be a correlation between proportion of patients admitted within 4 hours and proportion of patients receiving thrombolysis therapy. Referral areas St Olav and Finnmark had the lowest proportion of patients admitted within 4 hours, and simultaneously the lowest proportion of thrombolysis therapy, and referral area Stavanger had the highest proportion of patients admitted within 4 hours, and second-highest proportion of patients treated with thrombolysis therapy. In regional terms, Health West RHA and Health Central RHA had the highest and lowest target attainment, respectively, for both indicators. At the same time, the results in this context are not unambiguous. One example was Helgeland, which was among the referral areas with the highest

proportion of patients admitted within 4 hours, and among the referral areas with the lowest proportion of thrombolysis therapy. It is well documented that thrombolysis has greatest effect if given soon after onset of symptoms, preferably within 3 hours and no later than 4.5 hours (Norsk hjerneslagregister 2020). Roughly 55 % of patients with stroke were not admitted to hospital within 4 hours after the stroke, and therefore it is possible that some patients did not receive thrombolysis because they were admitted too late for thrombolysis to be considered useful. The highest possible proportion of thrombolysis treatment of patients with a stroke is not the same as good treatment quality, but it is a problem that more than half the patients in the country, and 70 % of patients resident in the referral area Finnmark, were admitted too late to reap a good benefit from thrombolysis, assuming that these patients were actually candidates for the procedure.

Patients with light and very light strokes were those who arrived last at the hospital (Norwegian Stroke Registry), most probably because they had less severe symptoms. The usefulness of thrombolysis in patients with light or very light stroke is uncertain, and the high proportion of patients who were admitted to hospital later than 4 hours after the stroke is therefore less of a problem seen in light of the high proportion of patients with a light stroke who arrived at the hospital late.

According to the Norwegian Stroke Registry, most of the variation in the use of thrombolysis was due to different therapeutic practices for light and very light stroke. The variation is less for the more severe strokes (Norsk hjerneslagregister 2020). Whereas the documentation showing that thrombolysis reduces functional impairment for patients with severe stroke is convincing, there is no robust documentation to show a corresponding benefit from thrombolysis treatment for patients with a light or very light stroke. Roughly 40 % of patients admitted to hospital due to stroke had a very light stroke, and 27 % had a light stroke (Norsk hjerneslagregister 2020). Thus, a large proportion of strokes is of the less severe variety, and different therapeutic practices for the less severe cases are the primary reason for the variation in the use of thrombolysis shown in the chapter on results. The differences in therapeutic practices for less severe stroke is not entirely unproblematic, since thrombolysis therapy is associated with added risk of cerebral hemorrhage, even in cases of light or very light stroke. According to the Norwegian Stroke Registry 2020, this risk was 5.4 % in 2019 for all severities of stroke combined, and 4.8 % for patients with light or very light stroke.

The level of knowledge today regarding effects and side-effects of thrombolysis does not enable us to determine what is the right target level for thrombolysis therapy. There were clear geographical differences in the use of thrombolysis in the period 2017-2019, and it is probable that they are due in part to different clinical practices when there is an indication to give treatment by thrombolysis. The long-term goal should be to establish a more uniform practice for thrombolysis treatment in cases of acute stroke.

3.1.4 Invasive cardiology

Invasive cardiology includes the examination and treatment of cardiac diseases using thin catheters (plastic tubes) that are threaded into the coronary arteries of the heart via a blood vessel in the wrist or groin. The key procedures performed in this special field are coronary angiography, structural opening of narrow coronary arteries (percutaneous coronary intervention, PCI), and insertion of a new heart valve. For coronary angiography, a radiographic contrast dye is injected into the artery, so that any narrowing or occlusion of the coronary arteries can be seen by x-ray. PCI is a common term for various procedures used to open an artery mechanically if it is narrow or occluded. One procedure is to insert a balloon that is inflated under pressure, to expand the arterial wall, another is to insert a tube-shaped piece of netting, called a stent, that will prevent the artery from collapsing again. Altogether, roughly 32,000 coronary angiography and/or PCI procedures are performed each year across 9 hospitals.

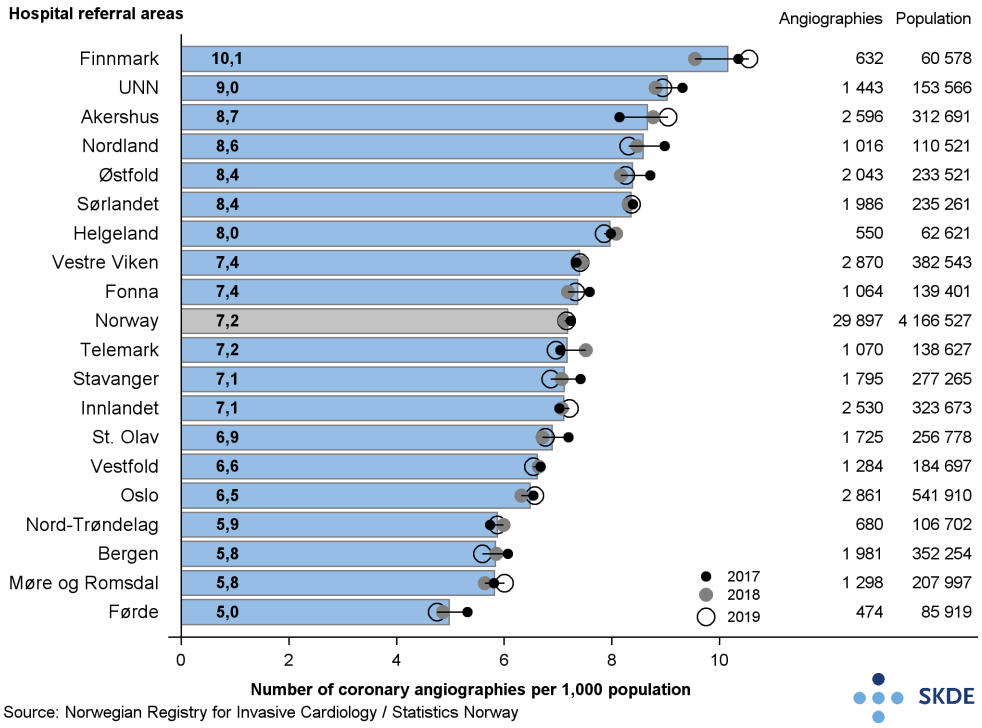

Figure 3.11: Number of coronary angiographies per 1,000 population, adjusted for age and gender, broken down by referral area. Bars show the average rates; annual rates are shown by symbol. Figures on the right show the number of angiographies and number of population. Average per year in period 2017-2019.

shows the annual number of coronary angiographies per 1,000 population, broken down by referral area in the period 2017-2019. The rate varied from 5 patients per 1,000 population among residents in the referral area Førde, to about 10 patients per 1,000 population for residents in the referral area Finnmark. Nationally, the rate has remained stable in the period 2017-2019.

Results

The Norwegian Registry of Invasive Cardiology (NORIC) has supplied data for this chapter. In consultation with the Registry, the indicators *proportion of PCI in patients undergoing invasive coronary procedures* and *proportion of procedures where pressure measurement was performed*

to judge the degree of narrowing of the coronary arteries, were chosen to illuminate the quality of service in the essential health services. The commitment to NORIC was 100 % during the period 2017-2019. The coverage ratio for coronary angiography was between 97 % and 99 %, and the coverage ratio for PCI was close to 100 % in the same period.

Proportion of PCI in patients undergoing invasive coronary procedures

Coronary angiography is a radiographic diagnostic tool used to determine whether there is coronary disease and whether percutaneous coronary intervention (PCI) is indicated. Since invasive procedures entail some risk to the patient, one goal is for the fewest possible number of patients with entirely normal blood vessels to be examined by invasive coronary angiography.

If an invasive procedure reveals narrowing of a coronary artery, then often PCI of the artery is merged into the angiography procedure. In other cases, PCI is performed at a later date.

The results presented here are for patients who have received PCI either in connection with their angiography, or at a later date. The Norwegian Registry of Invasive Cardiology's Advisory Board has not defined any target level for this indicator.

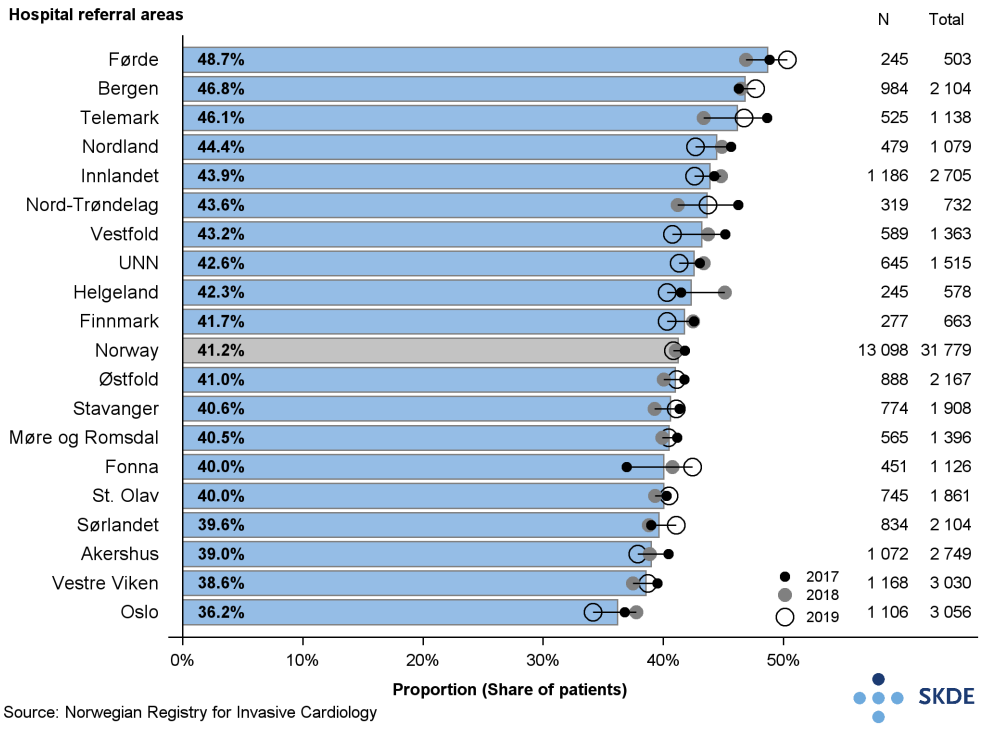

Figure 3.12: Invasive cardiology. Proportion of PCI in patients who underwent invasive coronary procedures broken down by referral area. Bars show the average proportions; annual proportions are shown by symbol. Figures on the right show the number of PCI procedures that were carried out (N) and the number of invasive coronary procedures (total relevant cases). Average per year in period 2017-2019.

Figure 3.12 shows that there was geographical variation in the proportion of PCI of narrow coronary arteries in patients who underwent invasive coronary procedures in the period 2017-2019. The proportion of coronary angiographies leading to PCI was highest for patients resident in the referral area Førde, where 48.7 % of coronary angiographies led to PCI. As Figure 3.11 shows, Førde simultaneously had the lowest number of coronary angiographies per

1,000 population, and overall, the results for Førde can suggest that selection of patients for angiography was more stringent for patients resident in this referral area. The proportion of PCI was lowest for patients resident in referral area Oslo, where 36.2 % of invasive procedures led to PCI. Sørlandet and Akershus were among the referral areas with the lowest proportion of coronary angiographies that led to PCI, at the same time as Figure 3.11 shows that these referral areas were among those with the highest number of coronary angiographies per 1,000 population. The annual variation shows that the results were relatively stable for all referral areas throughout the period.

Regionally there were small differences. The proportion of PCI in patients who underwent invasive coronary procedures averaged 40.3 % in Health South-East RHA, compared with 43.5 % in Health West RHA. The difference between regions with the highest and lowest proportion of PCI increased from 2017 to 2019. The proportion of PCI was 2 percentage points higher in Health West RHA than in Health South-East RHA in 2017. The corresponding figure for 2019 was 5 percentage points. At the national level, the proportion of PCI in patients who underwent invasive coronary procedures was stable, at just over 40 % throughout the period.

Proportion of procedures where pressure measurement was performed to judge the degree of occlusion of the coronary arteries

Coronary angiography can reveal normal vascular conditions in the patient's blood vessels, or there can be various degrees of narrowing of the arteries. Normal conditions in the arteries require no treatment, of course. If there are very narrow constrictions, this will affect circulation in the arteries, and further examination will be superfluous. If on the other hand there is a moderate degree of constriction, it may be difficult to assess whether the constriction is so narrow that it affects blood flow, or not. To decide the issue, then according to the Norwegian Registry of Invasive Cardiology's Annual Report, it may be necessary to conduct supplementary examinations like intracoronary pressure measurement. The usefulness of such pressure measurement to assess the degree of constriction in the coronary arteries is well documented and, again according to the Annual Report, is strongly recommended in the European guidelines.

The quality indicator *proportion of procedures where pressure measurement was performed to assess the degree of narrowing in the coronary arteries* has just two target levels. High target attainment has been set by the Advisory Board at pressure measurement for minimum 30 % of patients who undergo coronary angiography. Low attainment is put at below 30 %. The target level is set relatively low because pressure measurement is only relevant in patients where there is moderate occlusion of one or several blood vessels, so the measurement is of no relevance for many patients who are examined using coronary angiography. The results presented here are for patients with stable coronary arterial disease.

Figure 3.13 shows that target attainment overall was low for the quality indicator *proportion of procedures where pressure measurement was performed to assess the degree of narrowing in the coronary arteries*. None of the referral areas reached high target attainment for this indicator, assessed on the basis of average results for the period 2017-2019. However, Akershus and St Olav achieved high target attainment in 2019.

There was variation among the referral areas in the proportion of procedures where intracoronary pressure measurement was performed to assess the degree of narrowing of the coronary arteries. For patients resident in Finnmark, pressure was measured in 16.3 % of procedures, compared with 25.3 % in referral area St Olav. Most of the referral areas were tending towards a high

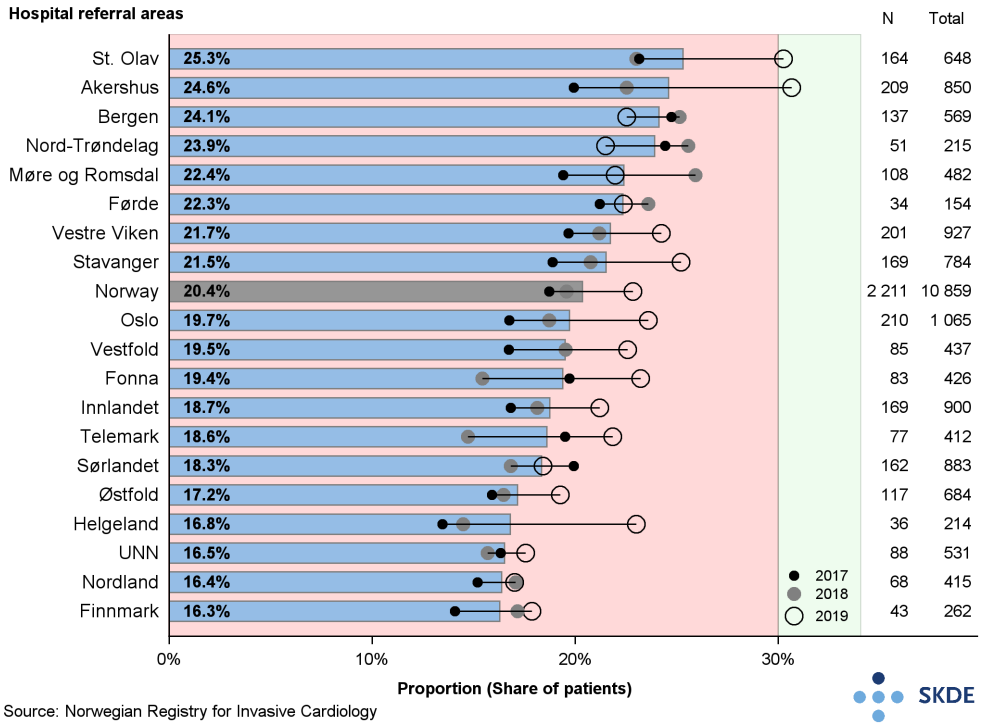

Figure 3.13: Invasive cardiology. Proportion of procedures where pressure measurement was performed to assess the degree of narrowing in the coronary arteries of patients with stable coronary arterial disease, broken down by referral area. Bars show average proportions; annual proportions are shown by symbol. Figures on right show number of procedures where pressure measurement was performed (N) and the total number of procedures (total relevant cases). Average per year in period 2017-2019.

proportion of pressure measurement during the period, but the differences between referral areas seemed to be increasing also. In 2017, the difference between referral areas with the highest and lowest proportion of pressure measurement was 9 percentage points. In 2019, the corresponding figure was 13 percentage points.

In regional terms, the proportion of intracoronary pressure measurement was highest in Health Central RHA, where pressure was measured in 24.0 % of examinations. The proportion was lowest in Health North RHA where 16.4 % were measured. Nationally, the proportion of intracoronary pressure measurement rose from 18.7 % in 2017 to 22.9 % in 2019.

Discussion of results

"In many cases, coronary angiography alone does not provide sufficient information to assess whether a narrowing (stenosis) is so narrow that it has consequences for the blood flow in the artery. It may be necessary to perform supplementary examinations to optimise the treatment. The usefulness of intracoronary pressure measurement to judge the degree of narrowing in the coronary arteries is well documented, and is strongly recommended in European guidelines" (Norsk register for invasiv kardiologi 2020). Therefore, it is compatible with good treatment quality to perform a pressure measurement in connection with coronary angiography, in cases where there is uncertainty regarding how much the narrowing of the blood vessel will affect the blood flow. The results show that the proportion of pressure measurement in connection with coronary angiography increased during the period, which is a positive and desirable

trend. At the same time, Figure 3.13 shows also that there was geographical variation in target attainment for this indicator. One possible cause of this effect may be that some referral areas examined more patients with normal blood vessels, and therefore had no need to do pressure measurement in connection with coronary angiography. This may be justified in variations in availability and practice regarding non-invasive procedures for coronary arterial disease, for example with CT examinations, or various stress tests with imaging, used to select patients for coronary angiography. At the same time, it is also possible that different specialist environments focus differently on use of intracoronary pressure measurement in connection with coronary angiography, and that this is a reason for the different levels of target attainment for this indicator.

Figures 3.11 and 3.12 show geographical variation both in rates of coronary angiography and the proportion of coronary angiographies leading on to PCI. It is known that there are different rates of vascular disease in different parts of the country, which is a natural reason for variation in rates of invasive coronary procedures. Another possible cause of the differences is the different opportunities to employ CT scans of the coronary arteries for patients in different referral areas in the period 2017-2019. A CT scan is a non-invasive examination with a high negative predictive value. This means that the chance that the patient has normal blood vessels, if the CT scan shows them to be normal, is high. Good access to this type of examination may therefore lead to fewer invasive examinations of patients with normal vessels. Fewer invasive examinations of patients with normal blood vessels will also lead to a higher proportion of coronary angiographies leading to PCI, because a larger proportion of patients undergoing invasive procedures will have narrow blood vessels. Coronary disease can also be treated using bypass surgery, but only a small part (7-10 %) of patients with coronary disease are treated with surgery (Norsk register for invasiv kardiologi 2020). Thus, there is no reason to believe that observed differences in proportion of angiographies that lead to PCI is significantly affected by differences in how many bypass surgeries are carried out on patients in the various referral areas.

Neither is there any reason to believe that the clinical assessment of whether or not PCI treatment is needed is substantially different at the various hospitals. The differences in angiography rates are therefore probably due mainly to different examination practices in advance of the invasive procedures.

3.2 Cancer

Cancer is a term used to designate diseases of uncontrolled cell division. Dividing cells form tumours that will continue to grow in size, displacing other vital organs. Unattached cancer cells can also migrate to other parts of the body, being transported in the blood or lymphatic system. Almost 35,000 people in Norway are diagnosed with cancer annually, and roughly 11,000 die each year from the disease (Cancer Registry of Norway 2019).

3.2.1 Colorectal cancer, bowel cancer

Colorectal cancer, also called bowel cancer, is the most frequent form of cancer in Norway, calculated on the total occurrence for both sexes, and occurrence of this type of cancer has doubled in the past 50 years for both women and men. In 2019, almost 3000 persons contracted colon cancer, and roughly 1100 contracted rectal cancer. The median age for diagnosis of colon cancer was 74 years for women, and 72 years for men, and for rectal cancer the median age for both sexes was 70 years. Around 1500 persons a year die from bowel cancer, whilst roughly 35,000 persons were living with the condition in 2019 (Cancer Registry of Norway 2020).

Figure 3.14 shows the incidence rate: the annual number of patients contracting colon cancer per 100,000 population, broken down by referral area in the period 2017-2019. The rate was roughly 90 per 100,000 in Møre og Romsdal, and more than 50 per 100,000 in referral areas OUS and Lovisenberg.

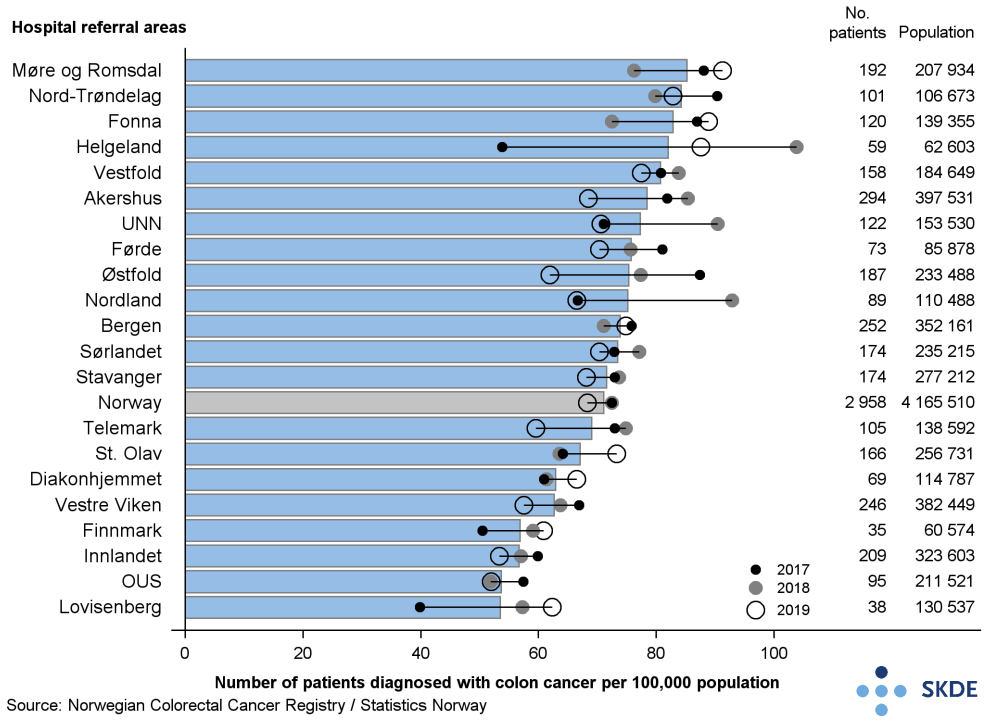

Figure 3.14: Number of patients diagnosed with colon cancer per 100,000 population, adjusted for age and gender, broken down by referral area. Age 18-99 years. Bars show the average rates; annual rates are shown by symbol. Figures on the right of the figure show the number of patients and number of population. Average per year in the period 2017-2019.

Curative treatment of bowel cancer is essentially by surgery, but a large portion of the patients also receive chemotherapy and/or radiation therapy as an adjunct to the treatment (Nasjonalt

kvalitetsregister for tykk- og endetarmskreft 2020). Surgical treatment for cancer has become more centralised in Norway, and in 2019 roughly 20 hospitals performed surgical interventions for rectal cancer, and roughly 30 hospitals offered surgery for colon cancer. A few interventions are also performed at other hospitals, because 15-25 % of patients with colon cancer, and a smaller proportion of rectal cancer patients, need an emergency procedure.

Colorectal cancer is amenable to keyhole surgery (laparoscopy) or open surgery. The choice of procedure depends on the location of the tumour and its size, whether it has spread, the genetic mutation, the patient's age and general health, and any additional diseases (Nasjonalt kvalitetsregister for tykk- og endetarmskreft 2020).

Figure 3.15 shows the annual number of persons contracting rectal cancer per 100,000 population (patient rate), broken down by referral area in the period 2017-2019.

The patient rate was roughly 37 per 100,000 population in Nordland and Helgeland, and less than 25 per 100,000 in referral areas Lovisenberg and Sørlandet.

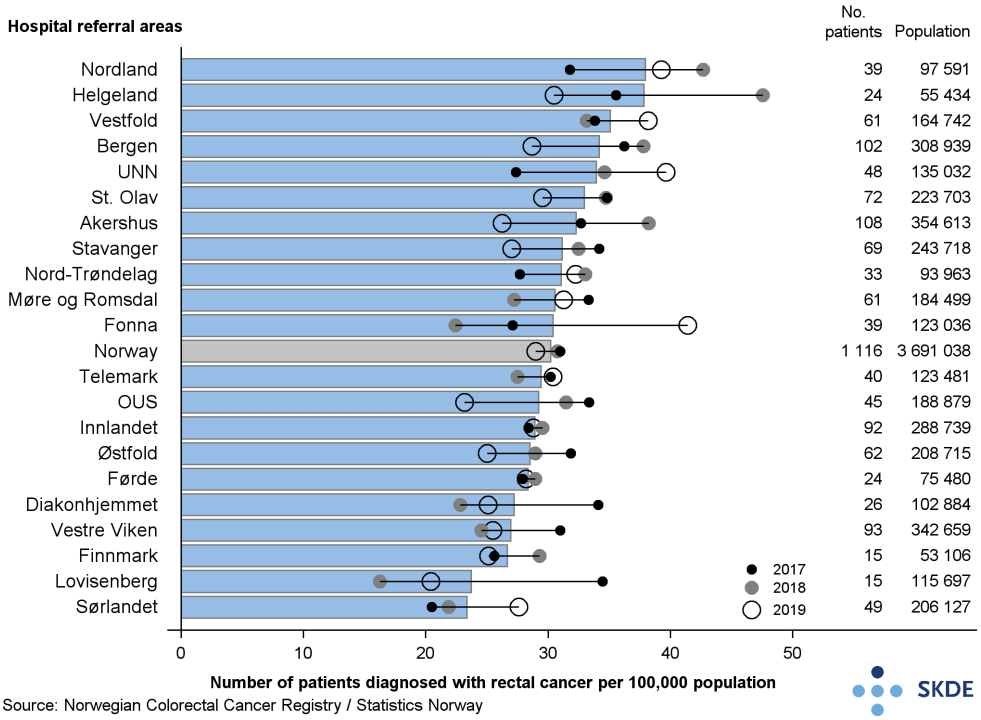

Figure 3.15: Number of patients diagnosed with rectal cancer per 100,000 population, adjusted for age and gender, broken down by referral area. Age 25-99 years. Bars show average rates; annual rates shown as symbol. Numbers to the right show the number of patients and the number of population. Average per year in period 2017-2019.

Results

The Norwegian Colorectal Cancer Registry has supplied the data for this chapter. In collaboration with the registry, the indicators *proportion of patients operated by laparoscopy, estimated proportion of patients without local relapse 5 years after operation for rectal cancer,* and *100-day mortality after operation for rectal cancer* were chosen to illuminate the quality of the essential health services. The results presented in this chapter may deviate slightly from figures presented in the Cancer in Norway report, with is due in part to the data in this project being compiled before completion of the Cancer in Norway report.

There was 100 % support for the Norwegian Colorectal Cancer Registry by relevant hospitals during the entire period, and the coverage ratio for surgery reports was roughly 85 % in 2017 and 90 % in 2018 and 2019. Note that Ahus hospital only reported about 40 % of its patients to the Registry in 2017. Roughly 80 % of local relapses are recorded in the Registry.

Laparoscopy

Open surgery and keyhole surgery (laparoscopy) are two different treatment methods, but considered equal regarding long-term results for treatment of colorectal cancers. Which technique is best suitable for which patient is assessed in part from professional criteria like the size of the tumour and its location, the department's expertise in laparoscopic procedures, and the patient's wishes. The advantages of using keyhole methods are smaller operational wound and less pain, and the patient returns to good health more quickly after the surgery. All units operating colorectal cancer in 2019 offered open and keyhole procedures, but the extent to which they were used was different in different hospitals (Nasjonalt kvalitetsregister for tykk- og endetarmskreft 2020). The results presented here cover patients with colorectal cancers in Stages I-III. Stages I and II are cancers located in the colon without spreading, Stage III is cancers with spreading to the lymphatic glands, and Stage IV is cancers in the bowel with extensive spreading (metastasis) to other parts of the body (Nasjonalt kvalitetsregister for tykk- og endetarmskreft 2020).

The indicator *proportion of patients operated by laparoscopy* has just two target levels, and they were adjusted in 2019 in light of developments in surgical procedures for the condition. In 2017 and 2018, high attainment was set by the Registry Advisory Board at minimum 30 % for laparoscopy, for patients with Stage I-III colorectal cancers. Low attainment was set at below 30 %. In 2019, the Advisory Board made adjustments so that high attainment was set at 60 %, and low attainment at below 60 %. The target level for 2019 is shown in the figures.

Looking at the period as a whole, the results for colon cancer show that 10 of 21 referral areas achieved high target attainment for the quality indicator *proportion of patients operated by laparoscopy*. Figure 3.16 illustrates the geographical variation in target attainment between the various referral areas for this indicator. Telemark and Vestre Viken had the highest proportion of operations by laparoscopy, respectively 80 % and 78 % of patients residing in these referral areas were operated by this procedure in the period 2017-2019, compared with 46 % and 23 %, respectively for patients resident in referral areas Nord-Trøndelag and Førde. Note that Førde only reported 56 % of patients to the Registry for this indicator in 2018 and 2019.

The annual variation shows major expansion in the use of laparoscopy to operate colon cancer in many referral areas, and that 13 referral areas achieved high target attainment in 2019, despite the target being raised in 2019.

Regionally the results also showed geographical variation in target attainment. Two regions showed high attainment, and two showed low attainment, based on a collected result in the period

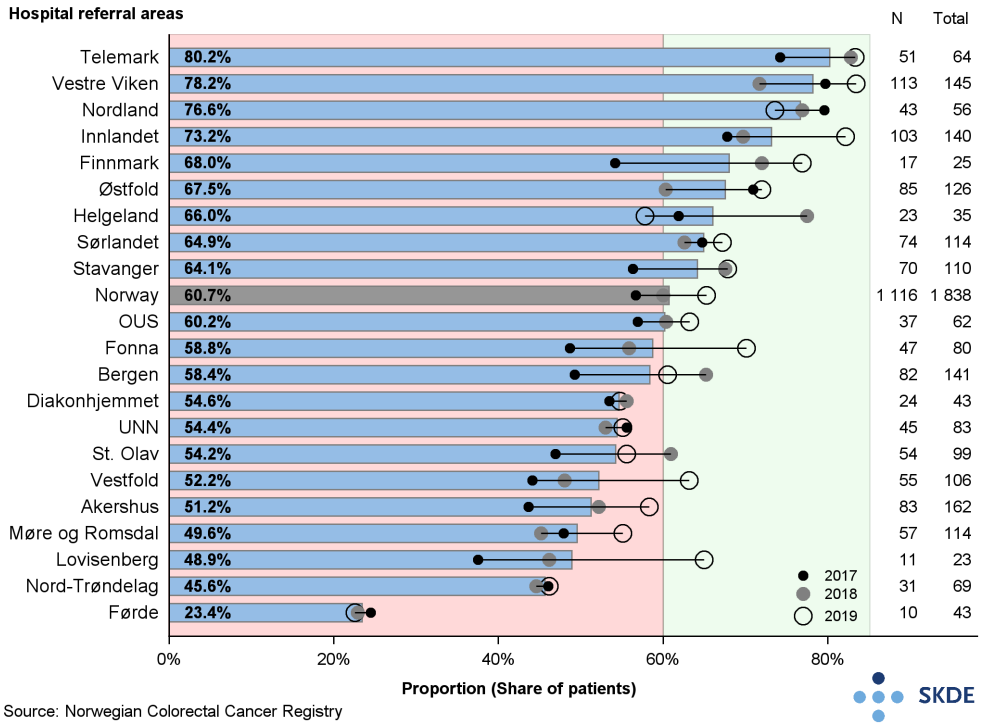

Figure 3.16: Colon cancer. Proportion of patients with colon cancer Stages I-III operated by laparoscopy, broken down by referral area. Age 20-99 years. Bars show average proportions; annual proportions are shown by symbol. Figures on right show number of patients operated by laparoscopy (N) and number of patients operated (total relevant cases). Average per year in period 2017-2019.

2017-2019. The proportion of patients with colon cancer that were operated using laparoscopy was highest in Health South-East RHA and Health North RHA with 65 %. The proportion was lowest in Health Central RHA, which had an average of 50 %. The corresponding result in Health West RHA was 56 %. Nationally, target attainment was high, with the proportion of patients operated using laparoscopy being higher than 60 % in the period 2017-2019.

The number of laparoscopy procedures for rectal cancer per year is low, and Figure 3.17 therefore shows an average for the period 2017-2019 without annual variation.

Nationally, the target attainment was high for the quality indicator *proportion of patients with rectal cancer operated by laparoscopy*. On average, 71 % of patients with rectal cancer Stages I-III were operated with laparoscopy in the period 2017-2019. Figure 3.17 shows that only 5 of 21 referral areas had low attainment for this indicator, despite the raising of the target level in 2019. There was geographical variation in the use of laparoscopy procedures. Roughly 92 % of patients resident in referral areas Nordland and Helgeland were operated by laparoscopy, compared with 38 % of patients resident in Fonna, and 32 % of patients resident in Nord-Trøndelag.

Regionally, the target attainment was high in all regions, and the proportion of laparoscopy was highest in Health North RHA. Roughly 84 % of patients with rectal cancer resident in Health North RHA were operated by laparoscopy, compared with 62 % of patients resident in Health Central RHA, which was the region with the lowest proportion of laparoscopy during the period. Health North RHA had more than 80 % laparoscopy procedures each year, whilst Health Central RHA made positive strides from about 53 % laparoscopy procedures in 2017 to about 76 %

laparoscopy procedures in 2019.

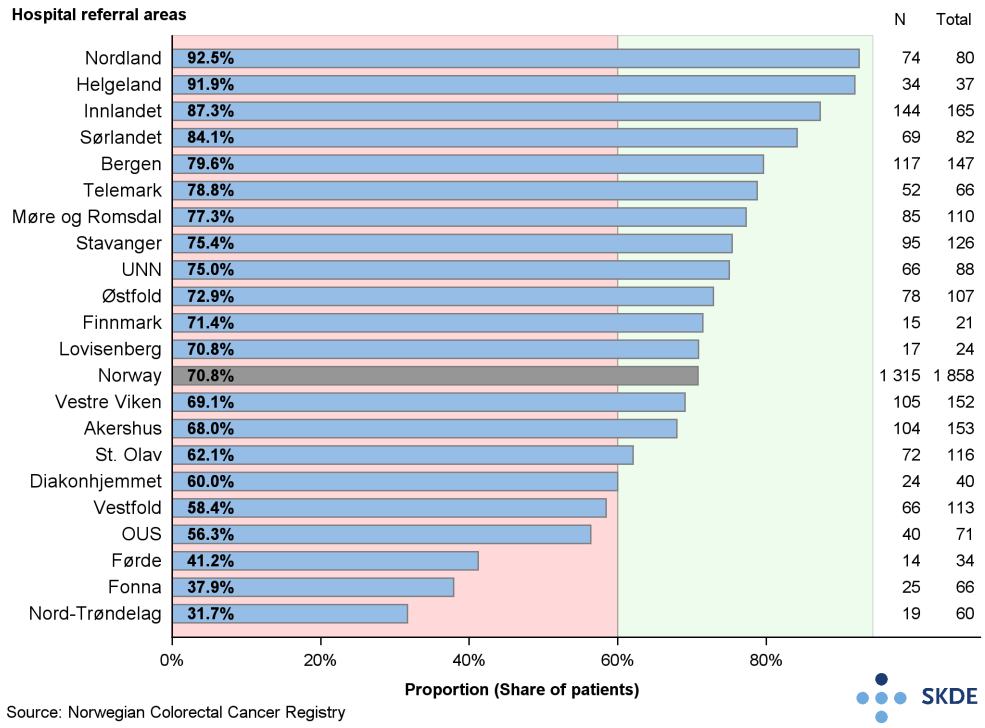

Figure 3.17: Rectal cancer. Proportion of patients with rectal cancer Stages I-III operated by laparoscopy, broken down by referral area. Age 25-96 years. Bars show average proportions. Figures to right show number of patients operated using laparoscopy procedures (N) and number of patients operated (total relevant cases). Average per year in period 2017-2019.

Rectal cancer, estimated proportion of patients without local relapse 5 years after operation

Local relapse is defined as relapse/ recurrence of the cancer disease in the same locality as the primary tumour, arising after the diagnostic period and after the operation (Nasjonalt kvalitetsregister for tykk- og endetarmskreft 2020). Patients with rectal cancer Stages I-III who have been operated for the primary tumour are monitored for up to 5 years after the operation by the Norwegian Colorectal Cancer Registry. The *estimated proportion of patients without local relapse 5 years after operation* is a key indicator for assessing both the quality of the diagnosis and the treatment of rectal cancer.

The proportion of relapse is estimated, since we do not have 5 years of monitoring of this patient category. The results each year are estimated on the basis of a preceding 3-year period, so that the results for 2017 are estimated on the basis of years 2015-2017, 2018 on the basis of 2016-2018, and 2019 on the basis of 2017-2019. Estimation of this sort means that there is considerable uncertainty in the results. In the latest monitoring period for local relapse, hospitals østfold and Haukeland failed to supply complete data, and the results for patients treated at those hospitals are therefore uncertain. Since the results presented here are not based on hospitals, but on the referral area where the patient lives, it is also unclear which of the results for referral areas are influenced by this uncertainty. Most likely, the results are most affected for referral areas østfold and Bergen.

The indicator *estimated proportion of patients without local relapse 5 years after operation* has

just two target levels. High target attainment for the quality indicator is set by the Registry Advisory Board as minimum 95 % of patients without local relapse 5 years after operation. Low target attainment is anything below 95 %.

Figure 3.18 shows that 14 of 21 referral areas achieved high target attainment for the quality indicator *estimated proportion of patients without local relapse 5 years after operation for rectal cancer*. The estimated proportion of patients with local relapse was highest in the Diakonhjemmet referral area. Of the patients resident in this referral area, 8.7 % suffered a local relapse, or were at risk of doing so, compared to just 1-2 % of patients residing in Sørlandet and Førde.

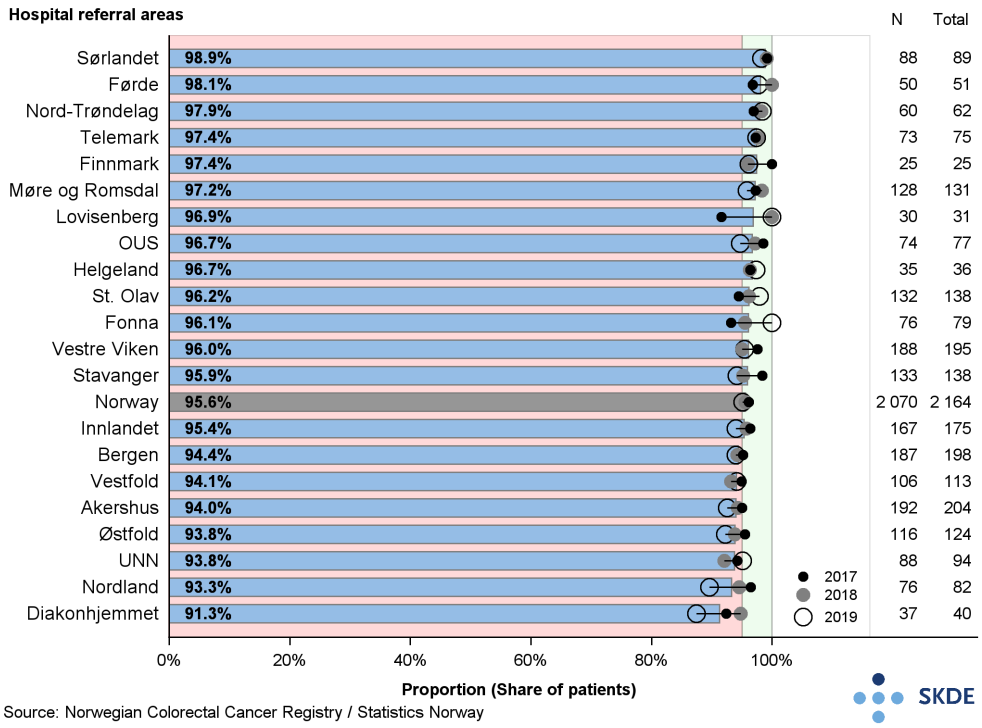

Figure 3.18: Rectal cancer. Showing estimated proportion of patients with rectal cancer Stages I-III without local relapse 5 years after the operation, broken down by referral area. Age 20-98 years. Bars show average proportions; annual proportions shown with symbol. Figures to right show the estimated number of patients without local relapse (N) and the number of patients with rectal cancer Stages I-III (total relevant cases). Average per year in period 2017-2019.

There were also regional geographical differences. Health North RHA achieved low target attainment, whilst the other regions achieved high attainment for this indicator. For patients resident in Health North RHA the estimated proportion of local relapse 5 years after operation was 5.4 %. The corresponding result for Health Central RHA, which was the region with the lowest proportion of estimated local relapse, was 3.1 %. Health West RHA and Health South-East RHA had an estimated proportion of local relapse of 4.2 % and 4.4 %, respectively, when the period is considered as a whole. The national target attainment was high; the estimated proportion of local relapse was 4.4 % when the period is considered as a whole, and 4.9 % in 2019.

Colon cancer patients, 100-days mortality after operation

The risk of death at 100 days after the operation is reckoned internationally as a measure of the risk of death associated with the intervention, either as the result of severe complications after surgery, or as a result of other factors, such as the patient suffering from additional diseases (Nasjonalt kvalitetsregister for tykk- og endetarmskreft 2020).

For colon cancer, the proportion of patients operated on an acute basis will be another key underlying factor for the risk of death. Modern treatments mean that deaths relating to treatment may occur a fairly long time after the operation, and this is the reason that the mortality after the colon cancer operation is registered as the 100-day mortality. An interval of 100 days can also include some cases of death due to other causes than the cancer procedure alone.

The indicator *proportion of colon cancer patients alive 100 days after operation* has just two target levels. High target attainment for the quality indicator is set by the Registry Advisory Board at minimum 95 % of patients surviving 100 days after the operation. Low attainment is below 95 % survival.

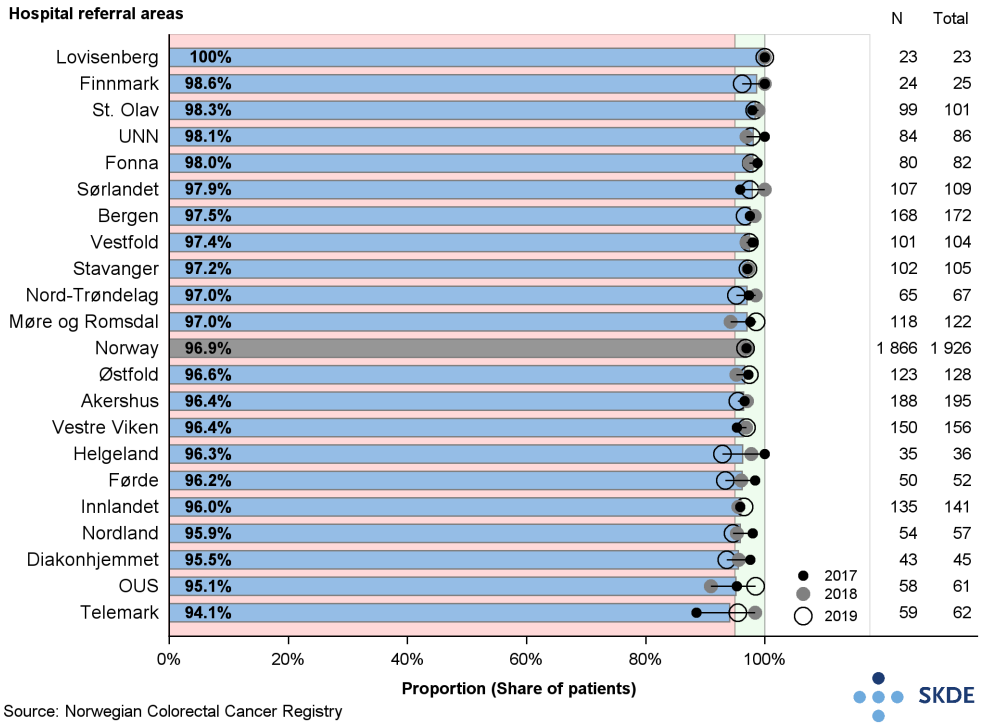

Figure 3.19: Colon cancer. The proportion of patients with colon cancer Stages I-III who were alive 100 days after the operation, broken down by referral area. Age 20-99 years. The bars show the average proportions; annual proportions are shown by symbol. Numbers to the right show the number of patients alive 100 days after the operation (N) and the number of patients operated (total relevant cases). Average per year in the period 2017-2019.

Figure 3.19 shows that the 100-day mortality overall was low for all referral areas, and that all referral areas except Telemark achieved high target attainment, when the results of the period are considered as a whole. In 2019, the mortality was greater than 5 % for patients resident in Helgeland (7.1 %), Førde (6.7 %), Diakonhjemmet (6.4 %) and Nordland (5.4 %). All regions returned 100-day mortality below 5 %, which means that regional target attainment in the period 2017-2019 was high. Health South-East RHA had the highest 100-day mortality with an average

result of 3.6 %, and it was lowest in Health Central RHA with an average of 2.5 %. Nationally, the attainment was high for this indicator. On average, the 100-day mortality was 3.1 % in the period, and 3.2 % in 2019 alone.

Discussion of results

The results show that the quality of treatment of this patient category in general terms was good during the period 2017-2019. At the same time, open surgery and laparoscopy were applied to different degrees, and there were also differences in the estimated proportion of local relapse 5 years after the operation for rectal cancer, and in the 100-day survival after the operation for colon cancer, both across the regions and across the referral areas.

Laparoscopy was increasingly used as an operational procedure during the period, for both colon and rectal cancer. At the national level, the proportion of operations using laparoscopy was roughly 10 percentage points higher for rectal than colon cancer.

For some referral areas, there seemed to be a correlation between the proportion of patients operated by laparoscopy for colon cancer and the proportion of patients operated by laparoscopy for rectal cancer. Førde and Nord-Trøndelag were among the referral aeras with the lowest proportion of laparoscopy, for both colon and rectal cancer, and Nordland was among the referral areas with the highest proportion of laparoscopy for both forms of cancer. Treatment of rectal cancer is more centralised than the treatment of colon cancer, and this may have skewed the result, because patients from the same referral area may have been treated at different hospitals, depending on the type of cancer presented.

There were major differences among the various regions regarding the proportion of patients operated using laparoscopy. These differences suggest that there were different professional approaches in different parts of the country, and the reason for that needs to be explored further.

The results for estimated proportion of local relapse and 100-day mortality after the operation were generally good and stable, which suggests good quality of treatment of this patient category. As figures 3.18 and 3.19 show, however, there were some referral areas that stood out with low target attainment. The patient population was rather small, so the impact of random variation may have been large. Moreover, the population may have been different in different geographical areas, for example the population consists of more elderly people in some referral areas, which may have swayed the results. At the same time, the results were adjusted for age and gender, without this affecting the result. Figures 3.18 and 3.19 also show that the annual variation for many referral areas was small, which also indicates that the results were not due to chance.

3.2.2 Breast cancer

Breast cancer is the most common form of cancer among women. In 2019, there were 3700 women who contracted breast cancer for the first time, and the median age at the time of diagnosis was 62 years (Nasjonalt kvalitetsregister for brystkreft 2020). The occurrence of breast cancer has risen significantly in recent decades, and the occurrence today is roughly twice what it was at the end of the 1950s.

Screening for breast cancer under the Mammography Program started in 1996, and today women are offered screening for breast cancer every two years from the age of 50 until they are 69 years of age. Some of the increase in breast cancer incidence may be due to this screening, because more cases are discovered now than previously. The influence of estrogen hormone on the mammary gland may play a key role in the development of breast cancer. The risk of contracting breast cancer is therefore reduced when the woman gives birth for the first time before turning 25 years of age, gives birth more than once, and by breastfeeding (Nasjonalt kvalitetsregister for brystkreft 2020).

Great strides have been made in the treatment of breast cancer in recent years. For those affected by the disease, the survival prospects are steadily improving, and those who do not recover completely, are living longer with the disease.

Figure 3.20 shows the annual number of women contracting breast cancer per 1,000 female population (patient rate), broken down by referral area. The patient rate varied from about 1.3 per 1,000 women for residents of Finnmark referral area, to more than 2 patients per 1,000 women for residents of Akershus referral area. Regionally, the patient rate was lowest for Health North RHA, where roughly 1.5 per 1,000 women contracted breast cancer, compared with roughly 1.8 per 1,000 for women in the other regions.

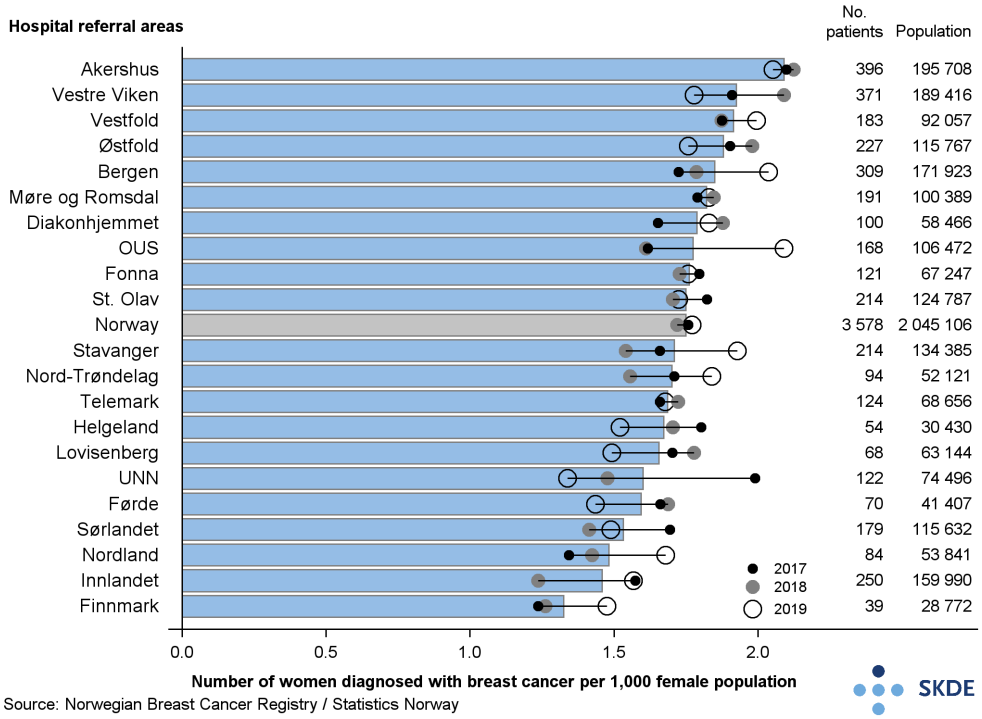

Figure 3.20: Breast cancer. Number of women diagnosed with breast cancer per 1,000 female population, adjusted for age, broken down by referral area. Age 19-99 years. The bars show the average rates; annual rates are shown by symbol. The numbers to the right show the number of women with breast cancer and the number of female population in the referral area. Average per year in the period 2017-2019.

Results

In close cooperation with the Norwegian Breast Cancer Registry, the indicators selected to illuminate the quality of care in the essential health services were: *proportion who only received one surgical intervention on the primary tumour* and *proportion of breast-conserving procedures for tumour of diameter less than 30 mm*. The Registry was supported 100 % by the reporting institutions during 2017-2019. The coverage ratio for surgery reports has increased from 89 % to 94 % during the period 2017-2019.

Proportion who only received one surgical intervention on the primary tumour

That one surgical procedure has been performed on the primary tumour means that it was not necessary to operate on the woman a second time after the initial breast surgery procedure. To manage to remove the tumour at the first intervention requires a thorough examination employing inter-disciplinary collaboration before the procedure, combined with excellent surgical planning. If only one surgical intervention was performed on the primary tumour, that is an expression of good diagnostics and treatment. Reoperations should be avoided since they tend to produce a less satisfying cosmetic result, and delay the commencement of aftercare. Reoperations are also a strain on the patient and resource-intensive for the health service.

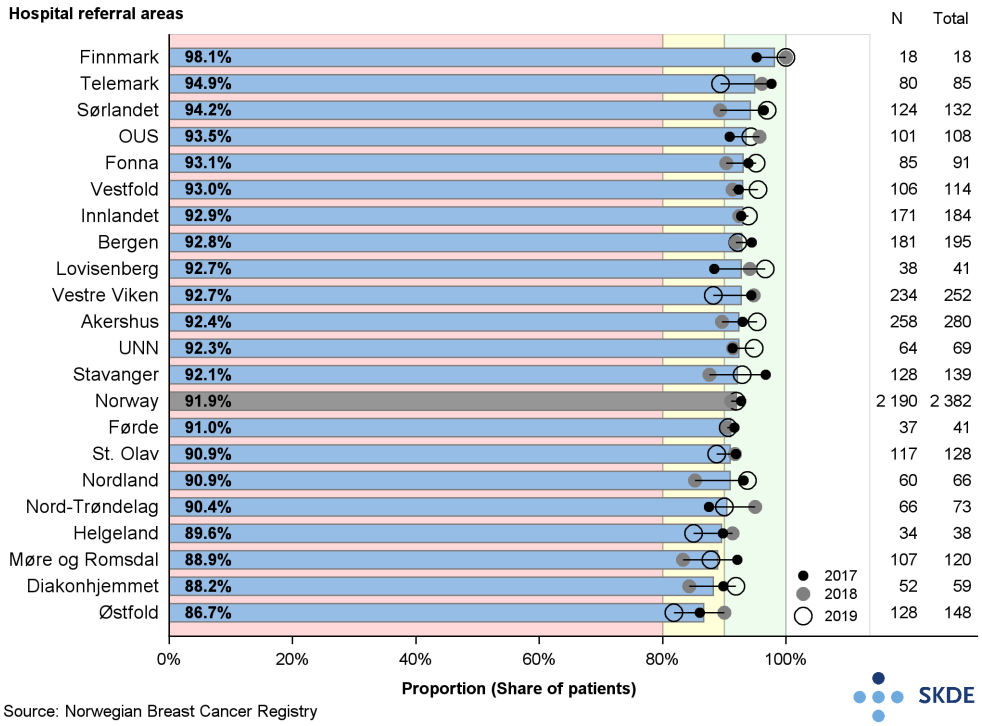

Figure 3.21: Breast cancer. Proportion of women who only received one surgical intervention on the primary tumour, broken down by referral area. Age 19-99 years. Bars show the average proportions; annual proportions are shown by symbol. Figures on the right show the number of women with only a single surgical intervention (N) and the total number of women who actually received surgery (total relevant cases). Average per year for the period 2017-2019.

The results for the quality indicator *proportion of women who only received one surgical intervention on the primary tumour* includes women with the first invasive case of breast cancer, who were operated in the period 2017-2019 with either a breast conserving operation or a mastectomy (full removal of the breast). High target attainment was defined by the Registry Advisory Board as one surgical procedure on the primary tumour for minimum 90 % of women with breast cancer. Moderate and low attainment was set at 80-89 % and below 80 %, respectively.

Of the 21 referral areas, 17 achieved high target attainment and 4 had moderate target attainment for this indicator when we examine the period 2017-2019 as a whole. The difference between proportion of women who only received one intervention on the primary tumour in Finnmark, which was the referral area with the highest proportion, and østfold, which had the lowest proportion, was about 11 percentage points. The small numbers for Finnmark weaken the certainty of the results. Of the referral areas, 10 achieve highest target attainment in 2019, whilst certain other referral areas had lower attainment in 2019 compared with previous years. The variations from year to year may be influenced by spurious factors, especially in the smaller referral areas, and the annual variation for the small referral areas are not therefore remarked on particularly here, but are shown in the figure. Regionally, there was very little variation in the results. All regions reported high attainment with a result of around 90 % in all three years, and therefore there was stable, high attainment also on the national level.

Proportion of breast-conserving surgery for tumour of diameter less than 30 mm

In breast-conserving surgery (BCS) procedures, only the tumour is removed from the breast, whilst the remainder of the breast is retained in place. The alternative is to remove the whole breast (mastectomy). Breast-conserving surgery can be performed if the area to be removed is not excessively large relative to breast size, or lies in an unfavourable location. After the operation, the patient receives radiation therapy for the breast, to destroy any residual cancer cells that might grow into new tumours later. Research has shown that breast-conserving procedures offer at least as good prognoses as removal of the entire breast (Nasjonalt kvalitetsregister for brystkreft 2020). The cosmetic outcome for most patients of breast-conserving procedures is good, and patients' self-esteem and quality of life has been shown to be better from such surgery, compared with removal of the entire breast. Moreover, breast-conserving surgery is less resource-intensive for the national health service (Nasjonalt kvalitetsregister for brystkreft 2020).

On the negative side, there are both absolute and relative contraindications for breast-conserving surgery. The size and extent of the malignant changes may be too extensive for this type of procedure. Factors such as pregnancy, heredity, general health and practical factors may render this surgical technique unsuitable. A few patients may also be unsuitable for essential radiation therapy after the breast-conserving operation (Nasjonalt kvalitetsregister for brystkreft 2020).

Women with the first invasive case of breast cancer, operated for the first time in the period 2017-2019, with a tumour of total diameter less than 30 mm, are included in these results. Women with larger tumours, and women who were given preoperational hormone therapy or chemotherapy with the aim of shrinking the tumour, are not included. High target attainment has been set by the Registry Advisory Board at minimum 85 % for breast-conserving operations on women with a tumour of less than 30 mm diameter. Moderate and low attainment is set at 70-85 % and below 70 %, respectively.

Figure 3.22 shows that there was geographical variation in target attainment for this indicator in the period 2017-2019. The referral areas Nordland, Nord-Trøndelag and Vestre Viken reported

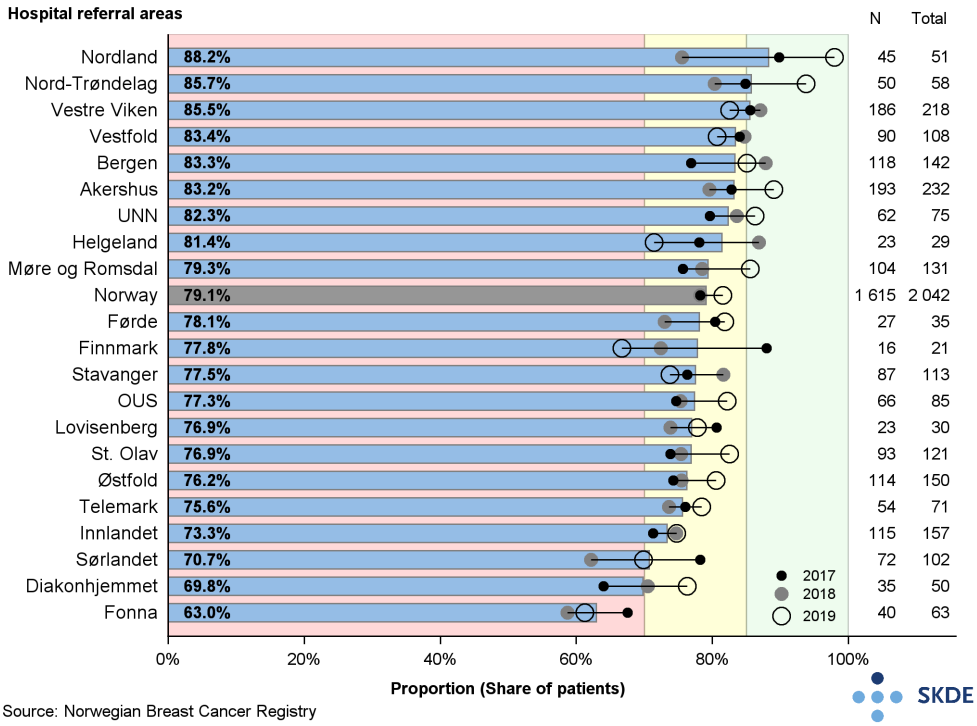

Figure 3.22: Breast cancer. Proportion breast-conserving surgeries, tumour diameter below 30 mm, broken down by referral area. Age 19-99 years. Bars show average proportions; annual proportions are shown by symbol. Figures on right show number of breast-conserving operations (N) and number of breast operations (total relevant cases). Average per year in period 2017-2019.

high target attainment, and 16 of 21 referral areas had moderate target attainment, and 2 had low target attainment, based on the overall result in the period. If the results for 2019 are rated in isolation, then 6 of 21 referral areas reported high target attainment. The differences among referral areas were considerable. Of the women resident in the Nordland referral area, 88 % were treated with a breast-conserving procedure, compared with 63 % in Fonna referral area.

In regional terms, the target attainment was moderate for all regions, rated on the basis of an overall result in the period 2017-2019. In 2 of the regions, Health North RHA and Health Central RHA, there was high target attainment in 2019. Health West RHA had the lowest proportion of breast-conserving surgery in the period 2017-2019. Of the women with breast cancer resident in Health West RHA, 77 % were treated in this way, compared with 83 % in Health North RHA. For 2019, the difference between the same two regions was 12 percentage points. For patients resident in Health North RHA, the proportion of breast-conserving surgeries was 6 percentage points higher in 2019, compared with 2017. The corresponding result for Health Central RHA was 9 percentage points, for Health South-East RHA 2 percentage points, and for Health West RHA 1.5 percentage points. Nationally, target attainment was moderate, and the proportion of breast-conserving surgeries was 79 % on average in the period. Nationally, the proportion of breast-conserving surgeries was just over 3 percentage points higher in 2019 than in 2017.

Discussion of results

Breast cancer is the most common form of cancer in women, and good quality of treatment of this disease is vital. The results for surgical quality in the treatment of breast cancer presented in

this chapter, show that the quality of treatment in this field is already good, but at the same time that there is room for improvement.

For the quality indicator *proportion who only received one single intervention on the primary tumour* (Figure 3.21) the target attainment was high for most referral areas, and the results showed little influence from geographical variation. All referral areas did not achieve a high level of target attainment, based on the average result in the period, but all referral areas did achieve high target attainment in at least one of the years in focus. It is a positive thing that most of the referral areas managed to treat a high proportion of patients with just a single operation. It indicates good organisation of the service and good interdisciplinary collaboration. At the same time, the Norwegian Breast Cancer Registry reports that a greater degree of single interventions is more prevalent with mastectomies, than with breast-conserving surgeries. That means that high target attainment for the quality indicator *proportion who only received one single intervention on the primary tumour* may correlate with the high prevalence of mastectomies, which is not a desirable result.

Figure 3.22 shows that too small a proportion of women received breast-conserving surgery and that there was geographical variation in target attainment. There was a 12-percentage points difference between the regions with the highest and lowest proportion of breast-conserving surgeries in 2019, and these differences between regions may suggest that different treatment choices and different priorities are prevalent in the different parts of the country. Among the referral areas there were also major differences. The proportion of women who were treated with breast-conserving surgery was 25 percentage points higher in the referral area with highest proportion of breast-conserving surgery, compared with the referral area with lowest proportion. The causes of the differences among referral areas might be different specialist practices, for example, different information to the patients, or the women's own wishes.

The use of preoperative treatment prior to surgery may also be a cause of variation, as also the availability of expertise in oncoplastic surgery for breast patients can vary among referral areas. This expertise is required to remove large tumours with good cosmetic results. If the woman chooses to have breast-conserving surgery, she must also receive radiation therapy after the procedure. Radiation therapy takes 3-4 weeks, and some women prefer not to undergo the treatment.

3.2.3 Lung cancer

Lung cancer makes up about 10 % of all new cases of cancer in Norway. The number of persons contracting lung cancer is still rising, and there are now annually more than 3000 new cases in Norway (Nasjonalt kvalitetsregister for lungekreft 2020). Equal numbers of women and men get lung cancer. But whereas the incidence for men has plateaued, the incidence for women is still rising. The median age when diagnosed is 71 years of age, and the disease is uncommon before 50 years of age. Lung cancer is one of the forms of cancer that is easiest to prevent, since 8 out of 10 cases are due to use of tobacco. From the 1970s until the present, the proportion of the adult population that regularly smokes has fallen from over 40 % to less than 10 % (Folkehelseinstituttet 2020). Even so, the number of lung cancer patients is rising, which is because lung cancer only develops after a long period of smoking, roughly 30 years according to the Folkehelseinstituttet (2020). Therefore, it will take a while before the positive effect of reduced tobacco consumption shows up, but a lower consumption of tobacco by the younger section of the population is expected to lead to a reduction in the occurrence of lung cancer in the long term.

Lung cancer is the form of cancer that causes the most deaths. Only 1 in 4 patients will survive 5 years after the diagnosis is made. The cause of the high mortality is both the aggressive nature of the disease, and the fact that lung cancer in half of the patients is only discovered at a late stage of the disease, when a cure is no longer possible (Nasjonalt kvalitetsregister for lungekreft 2020). The introduction of modern procedures does however mean that survival is twice as high today as it was just 10 years ago. Examination has become quicker due to clinical pathways, and more precise thanks to cytogenetic analyses, which are important for the selection of therapies. Treatment and monitoring of lung cancer patients are therefore more patient-customised today than previously, which is expected to bring even better survival rates in the years to come.

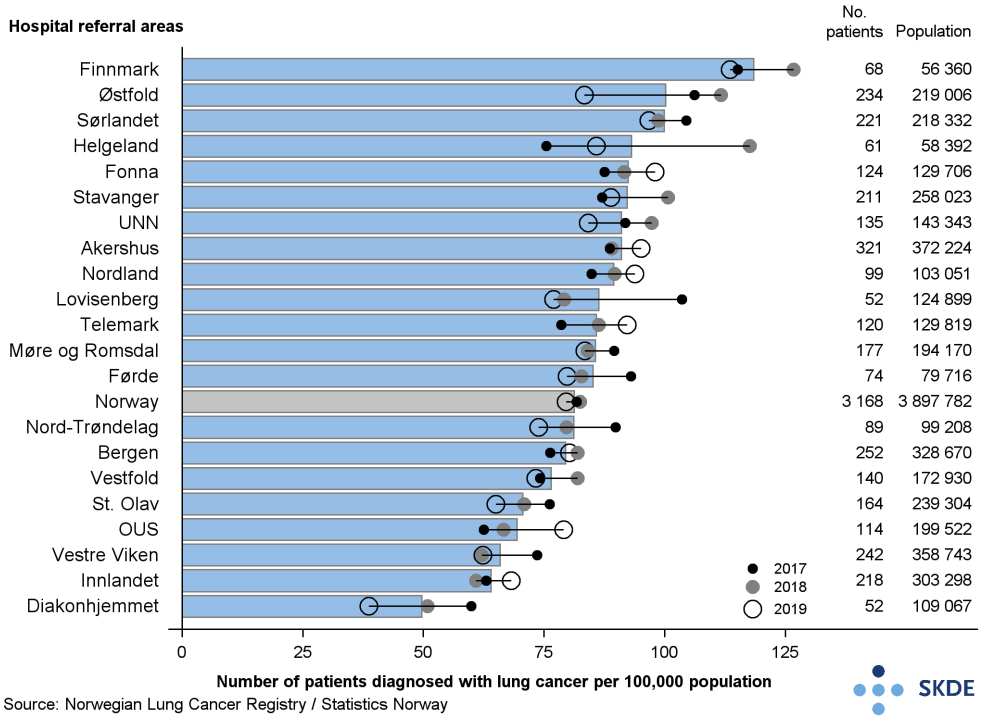

Figure 3.23: Number of patients diagnosed with lung cancer per 100,000 population, adjusted for age and gender, broken down by referral area. Bars show average rates; annual rates are shown by symbol. Figures on the right show the number of patients and number of population. Average per year in period 2017-2019.

Figure 3.23 shows the annual number of persons who contracted lung cancer per 100,000 population, broken down by referral area, in the period 2017-2019. The rate was more than twice as high in the Finnmark as in the Diakonhjemmet referral area. Some referral areas have a high proportion of population who smoke, which is a likely explanation for the differences in rates of lung cancer incidence.

Results

In consultation with the Norwegian Lung Cancer Registry, the indicators *proportion of curative treatment* and *median survival* were chosen to illustrate the quality levels in the essential health services.

The Norwegian Lung Cancer Registry supplied data for this chapter. The coverage ratio for clinical surgery reports was 99.9 % for this Registry in 2019. The corresponding ratio for radiotherapy was 51.9 %. In Norway, there are 8 and 10 hospitals, respectively, which perform surgical and radiation treatment for lung cancer, and they are responsible for submitting the clinical treatment reports to the Cancer Registry of Norway. The Cancer Registry of Norway also receives technical details of all radiation therapy given in Norway, so that the total number of patients treated is known. For the quality indicator *median survival*, data is taken from the Cancer Registry of Norway's Statistics Bank, where the coverage ratio is 97 %.

Proportion of lung cancer patients treated with curative therapy

Curative treatment is designed to return the patient to health. There are three forms of curative therapy: surgery; stereotactic body radiotherapy (SBRT, accurate, high-dose, non-invasive radiation procedure spread over few treatments, also known as radiosurgery); and traditional radiotherapy (high total radiation dose administered in multiple small increments, most often in combination with chemotherapy). The radiosurgery option has been offered nationwide since 2014, and can be given to patients with localised disease, where the risk of surgery is considered too large (Nasjonalt kvalitetsregister for lungekreft 2020). For curative therapy, high target attainment for this indicator has been set by the Advisory Board at minimum 35 % of patients with lung cancer. Moderate and low attainment is set at 30-34 % and below 30 %, respectively.

Figure 3.24 shows that high target attainment was achieved for Norway as a whole with almost 40 % receiving curative therapy. Nationally, more than half (55.8 %) received curative surgery, whilst the remainder received stereotactic or traditional radiotherapy.

The numbers for the various referral areas show that 17 of 21 achieved high target attainment, based on the average result for the period 2017-2019, and the other referral areas reached a moderate attainment level. For 2019, however, only 12 of 21 referral areas reached the high attainment level, and some even returned low attainment in the year. There were geographical differences among the referral areas. The proportion was highest in St Olav, where almost 50 % of patients received curative therapy in 2017-2019. Førde, Innlandet and Nordland had the lowest proportions, with more than 30 % of patients resident in these referral areas being treated with curative methods in the same period.

All the Regional Health Authorities achieved a high target level when the period is considered as a whole. The proportion of patients with lung cancer who were treated with curative therapy was highest in Health Central RHA. On average, 44 % of patients with lung cancer resident in this region received that treatment, compared with 38 % in Health South-East RHA. At the national level, less than 40 % of patients with lung cancer were given curative therapy in the period.

Nationally, the proportion of patients treated with curative intent was roughly 3.5 percentage points lower in 2019 by comparison with 2017 and 2018.

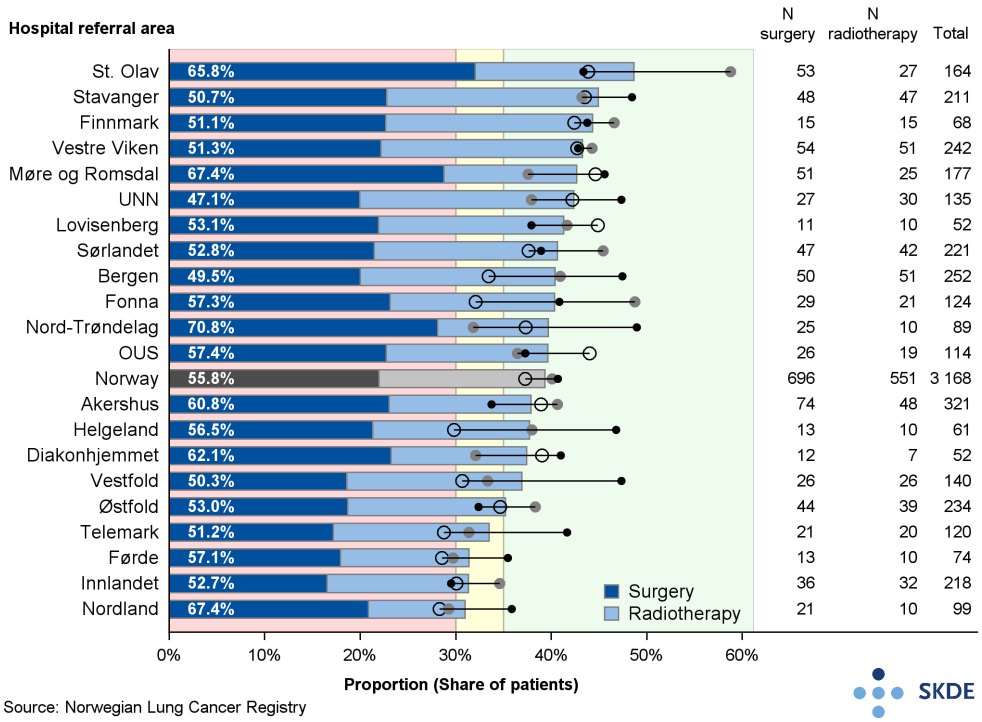

Figure 3.24: Lung cancer. Proportion of patients with lung cancer treated with curative therapy, broken down by referral area, surgery and radiotherapy. The bars show the average proportion of curative treatment. The percentages in the bars indicate how large a proportion of curative treatment was given as surgery. The figures on the right of the figure show the number of patients receiving surgical therapy (Nkir), number of patients receiving radiotherapy (Nstråle), and number of patients diagnosed with lung cancer (Total relevant cases). Average per year in the period 2017-2019. For an explanation of the symbols for annual variation, see Figure 3.23.

The referral area with lowest proportion of surgical therapy of lung cancer was Innlandet with 17 %. The proportion of surgical therapy was highest in St Olav, where 32 % of patients with lung cancer were operated. At the regional level, the proportion of patients with lung cancer given surgical therapy was about 21 % in all regions, but not Health Central RHA, where the proportion of lung cancer patients given surgical therapy was 30 %. Nationally, the proportion of patients receiving surgical therapy was stable at roughly 22 %. For patients who were treated with curative intent, the proportion receiving surgery varied from 47.1 % in referral area UNN, to 70.8 % in referral area Nord-Trøndelag. At the national level, 55.8 % of curative therapy was given as surgical therapy.

Median survival (in months)

The *median survival* indicator shows how long it took before 50 % of patients receiving a lung cancer diagnosis in the period 2017-2019, regardless of stage, died. High target attainment was set by the Registry Advisory Board as median survival of minimum 14 months, moderate and low attainment as 12-14 and below 12 months, respectively. The results presented in Figure 3.25 have not been adjusted for age or gender, or for cancer stage at the time of diagnosis.

Nationwide the median survival after diagnosis of lung cancer was 12.6 months, based on the

average result in the period. National trends were positive, with median survival at 13.6 months in 2019 by comparison with 11.7 months in 2017.

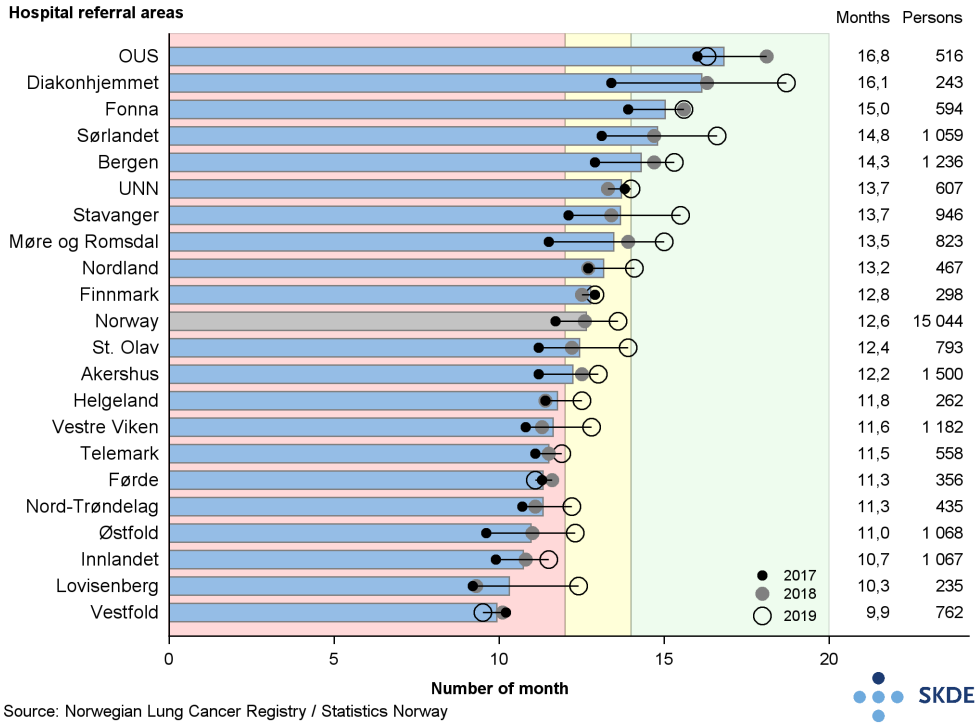

Figure 3.25: Lung cancer. Median survival in months, broken down by referral area. Bars show average for period, annual results shown by symbol. Numbers to the right of the figure show the median survival in months, and the number of persons with lung cancer that the survival analysis is based on. Average per year in period 2017-2019.

Figure 3.25 shows that there was geographical variation in median survival in the period 2017-2019. Five of the referral areas reached high target attainment, whilst attainment was moderate or low in 7 and 9 of the referral areas, respectively. Median survival was lowest for patients resident in Vestfold referral area at 9.9 months. By comparison, the median survival was 16.8 months in the OUS referral area, which represents a gap of about 7 months. For most referral areas development was positive in the period, with an increase in median survival in 2019 compared with 2017.

In regional terms, the target attainment was high in one region (Health West RHA) with a median survival of 14.0 months in the period. Attainment was moderate in the other regions, based on an overall result, at 12.0 months for patients resident in Health South-East RHA, 12.6 months in Health Central RHA, and 13.0 months in Health North RHA.

Discussion of results

The proportion of patients given curative therapy has increased in recent years. Treatment and follow-up of lung cancer patients is steadily improving and more customised to each patient, and an ever-increasing proportion of patients can therefore be offered curative therapies. Figure 3.24 shows that 17 out of 21 referral areas reached a high attainment level for curatively intended treatments, when the period is considered as a whole, but that only 12 out of 21 referral areas reached a high attainment in 2019. The numbers are small, and the lower attainment in 2019 is

therefore likely due to spurious factors.

Figure 3.24 also shows that there were differences between referral areas in terms of the proportion of curative therapy patients, and that surgical procedures were employed in different degrees as a treatment method in the various referral areas. This result does not change when we adjust for age and gender, and therefore it seems that age differences in patient populations are not the cause of different treatment pathways being followed. The results have not been adjusted for cancer stage when diagnosis was made, and it is therefore possible that one cause of the variation is that some referral areas reported more patients with more serious cancer at the time of diagnosis. Needless to say, this needs to be investigated further.

Better treatments have led to more patients now getting well, and more living longer after being diagnosed with lung cancer now than hitherto. In addition to the increasing proportion of patients getting curative treatment, there is also a better treatment range offered to patients receiving palliative drug therapy, which is another important reason why patients are living longer (Nasjonalt kvalitetsregister for lungekreft 2020). Both therapies targeting mutations and immunotherapy have revolutionised treatment of lung cancer, and patients with metastases, who previously had a life-expectancy of less than a year, can now look forward to 5-10 years of extra lifetime (Nasjonalt kvalitetsregister for lungekreft 2020).

Figure 3.25 shows that there was geographical variation in the median survival in the period 2017-2019. There may be a number of reasons for this, for instance that some of the variation may likely be due to some referral areas having more patients with lung cancer which was at a more serious stage when diagnosed. For small referral areas, the median survival is calculated for a small number of patients, so the effects of random variation can be significant. Nevertheless, the causes of the geographical variation shown in Figure 3.25, and why the median survival was significantly lower for patients resident in certain referral areas should be investigated

3.2.4 Prostate cancer

Prostate cancer is the most prevalent form of cancer in men in Norway, with around 5000 males being diagnosed with the disease each year. The median age at diagnosis is 70 years, and more than 900 men die each year from prostate cancer (Nasjonalt kvalitetsregister for prostatakreft 2020). Prostate cancer presents differently in men who are affected, it may be aggressive or mild, but in general terms it is a condition with a long life-expectancy. Because the number of men diagnosed each year is higher than the number dying, the number of men living with prostate cancer is increasing, and so is the number requiring to be monitored for the disease. In 2019, there were upward of 54,000 men living with prostate cancer in Norway.

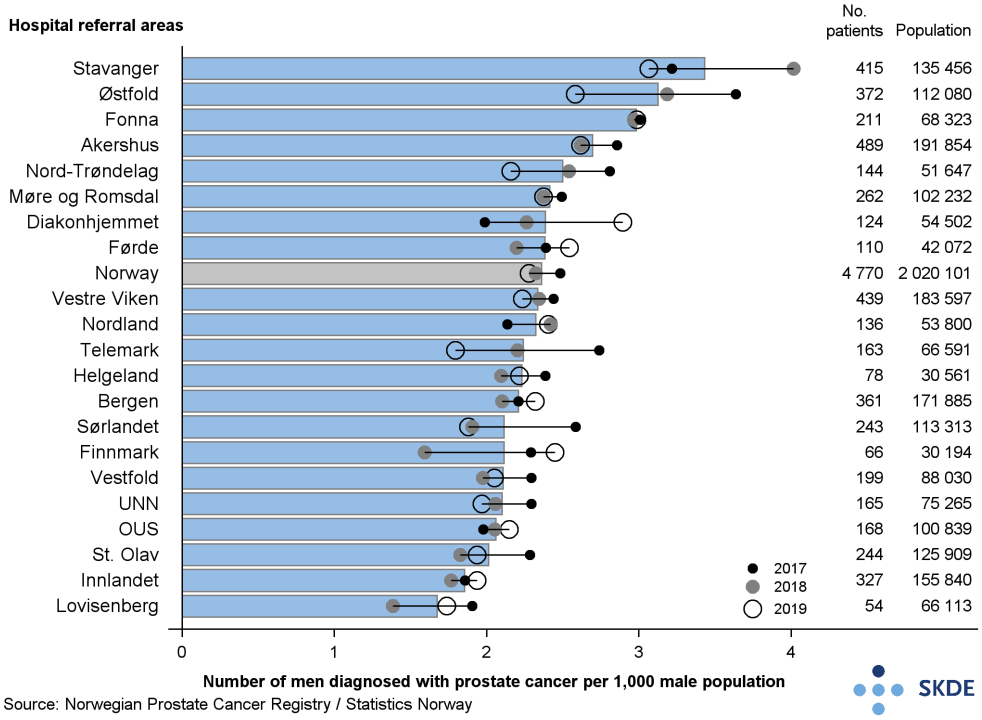

Figure 3.26: Prostate cancer. Number of men diagnosed with prostate cancer per 1,000 male population, adjusted for age and broken down by referral area. Age 20-99 years. Bars show the average rates; annual rates shown by symbol. Numbers to the right of the figure show the number of men with prostate cancer and number of male population. Average per year in period 2017-2019.

Prostate cancer is subdivided into stages (T-stage) according to the extend and location of the tumour. Tumours in stage T1 are so small that they are not noticeable in the prostate gland, T2 is slightly larger tumours that are restricted to the prostate gland, and T3 is major tumours that are growing outside the prostate gland, whilst T4 is those that have expanded into neighbouring organs and structures (Nasjonalt kvalitetsregister for prostatakreft 2020). On the basis of findings made when examining the patient, the disease is categorised as either low-risk, medium-risk, high-risk localised, high-risk local advanced, or metastatic disease with remote spreading. The risk group that the patient belongs to is determined from an overall assessment of the T-stage of the tumour, and whether there is spreading to neighbouring lymph nodes (N-stage) or remote spreading to other organs (M-stage), the level of prostate specific antigens in the blood, and an assessment of the growth pattern of the cancer cells (Gleason score), assessed by microscopic examination of tissue samples from the prostate gland (Nasjonalt kvalitetsregister for prostatakreft 2020).

Which therapy is offered will depend on how extensive and aggressive the disease has become when the patient is diagnosed. Both surgery, radiotherapy, hormone therapy, chemotherapy and combinations of the above may be indicated. In some cases, for example where the cancer is not extensive and not aggressive, the best alternative may be active monitoring of how the disease develops, rather than treatment (Nasjonalt kvalitetsregister for prostatakreft 2020).

Results

In consultation with the Norwegian Prostate Cancer Registry the indicators *proportion high-risk patients receiving radical treatment for prostate cancer* and *proportion clear surgical margin after operation for cancer tumours located in prostate (pT2)* were chosen to illustrate the quality of the essential healthcare services. The Norwegian Prostate Cancer Registry supplied the data for this chapter. The Registry is supported 100 % and the coverage ratios from 2017-2019 were 69 %, 81 % and 85 %, respectively.

Proportion high-risk patients receiving radical treatment

Both radical prostatectomy (surgical removal of the prostate gland) and radiotherapy are treatment forms that have the potential to cure prostate cancer, even in high-risk patients. This radical treatment may produce long-term effects, especially relating to urine incontinence, sexual function and bowel function (Nasjonalt kvalitetsregister for prostatakreft 2020). The alternative to radical treatment is active monitoring of the disease, but patients in the high-risk group should principally get radical treatment, provided the patient wants that, and is fit enough to tolerate such treatment (Nasjonalt kvalitetsregister for prostatakreft 2020).

The results include radical treatments in the high-risk group at age 38-78 who were diagnosed in 2017 and 2018, who were treated up to 2019 inclusive. This indicator has two target levels only: High attainment has been set by the Registry Advisory Board at *radical treatment of minimum 70 % of high-risk patients with prostate cancer*. Low attainment is set to below 70 %.

Figure 3.27 shows that most of the referral areas achieved high target attainment for this indicator. Even so, there were some referral areas with low attainment, which means there was geographical variation in the proportion of high-risk patients who received radical treatment in the period. Of the 21 referral areas, 4 had low attainment, namely Nord-Trøndelag, Vestfold[6], St Olav and Telemark, based on the average result in 2017 and 2018. Note that Telemark achieved high target attainment for patients diagnosed in 2018. Førde and Stavanger had the highest proportion of high-risk patients who received radical treatment, with results of 88 % and 84 %, respectively. The results show that around 30 percentage points separated the referral areas with highest and lowest proportion of radically treated high-risk patients, when the period is seen as a whole. Regionally, there were geographical differences. Target attainment was high in 3 of the regions, but low in Health Central RHA. Of the high-risk patients resident in this region, 63 % received radical treatment, which compares with 82 % of patients in Health West RHA.

The percentages of high-risk patients resident in Health South-East RHA and Health North RHA who received radical treatment in the period were 73 % and 75 %, respectively. Nationally, the proportion was stable at around 75 %. Small sample sizes for the small referral areas must be considered when assessing the results.

[6]Sykehuset Vestfold has quality-assured its registration data, according to the Cancer Registry of Norway. The review showed that some patients who had been reported as high-risk belonged to a different risk category. This probably affects the results for residents in the Vestfold referral area.

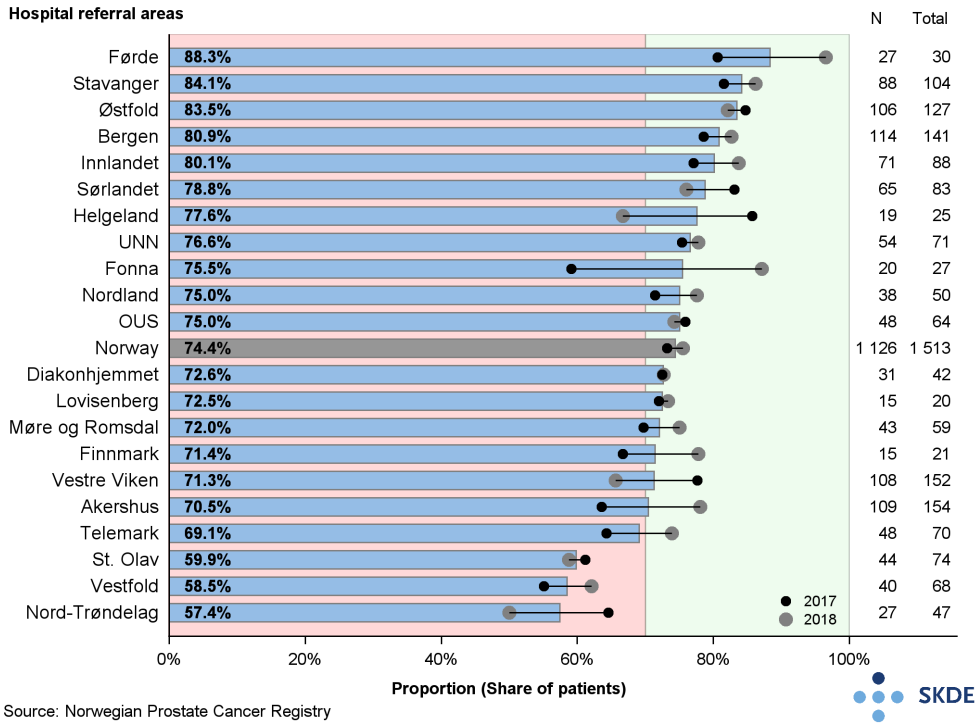

Figure 3.27: Prostate cancer. Proportion of high-risk patients (diagnosed in 2017-2018 but treated up to and including 2019) who received radical therapy, broken down by referral area. Age 38-79 years. Bars show average proportions; annual proportions are shown by symbol. Numbers to the right show the number of radical therapy patients (N) and number of high-risk patients (total relevant cases). Average per year in period 2017-2018.

Proportion clear surgical margin after operation for cancer tumours located in prostate (pT2)

Cancer surgery with curative intent should as a rule remove the tumour entirely. After an operation to remove the prostate gland, the tissue is examined by a pathologist, who determines whether the surgeon has achieved a clear surgical margin around the cut, or whether there are still some cancerous cells in the margin of the operation site. To be sure that all cancerous cells have been removed, there must be fresh tissue at the outer margins of the removed tissue. If the cells at the margin are normal, the margin is clear. If there are cancerous cells in the margin, the margin is contaminated (unclear). The pathologist will also determine at what stage the cancer is (the pT stage). If the tumour belongs in stage pT2 (tumours limited to the prostate gland), then a clear margin is expected to a larger extent than with larger tumours. To mitigate the risk of impotence and urine incontinence in the patient, the surgeon may choose to operated using a nerve-conserving procedure, but use of this procedure may increase the risk that a clear margin is not obtained. A non-clear margin increases the risk of relapse, and means as a rule that the patient must receive radiotherapy with a high risk of multiple side-effects and long-term effects (Nasjonalt kvalitetsregister for prostatakreft 2020). High target attainment for this indicator has been set by the Registry Advisory Board at minimum 85 % of patients having a *clear surgical margin after removal of cancer tumours located in the prostate gland*. Moderate and low attainment is put at 75-84 % and below 75 %, respectively. The results presented here concern persons in the age group 37-80 years.

Figure 3.28 shows that there was geographical variation in target attainment for the quality

indicator *proportion of clear surgical margin after operation of cancer tumours located in the prostate gland* in the period 2017-2019. Roughly 93 % of patients in referral area Førde displayed a clear margin, compared with only 69 % of patients in Nordland, which is a gap of 24 percentage points. Of the 21 referral areas, 11 achieved high target attainment, 9 had moderate target attainment, and 1 showed low target attainment, reckoned on the basis of the overall result for the period. Most of the referral areas with an average lower-than-high target attainment level showed positive development on a growing proportion of patients with a clear margin in 2019. This was not the case for referral areas Nordland and Telemark, where a lower proportion of patients had a clear margin in 2019, compared with both 2017 and 2018. The small sample sizes mean that these results will often vary from year to year, and interpreting the results is therefore an uncertain business.

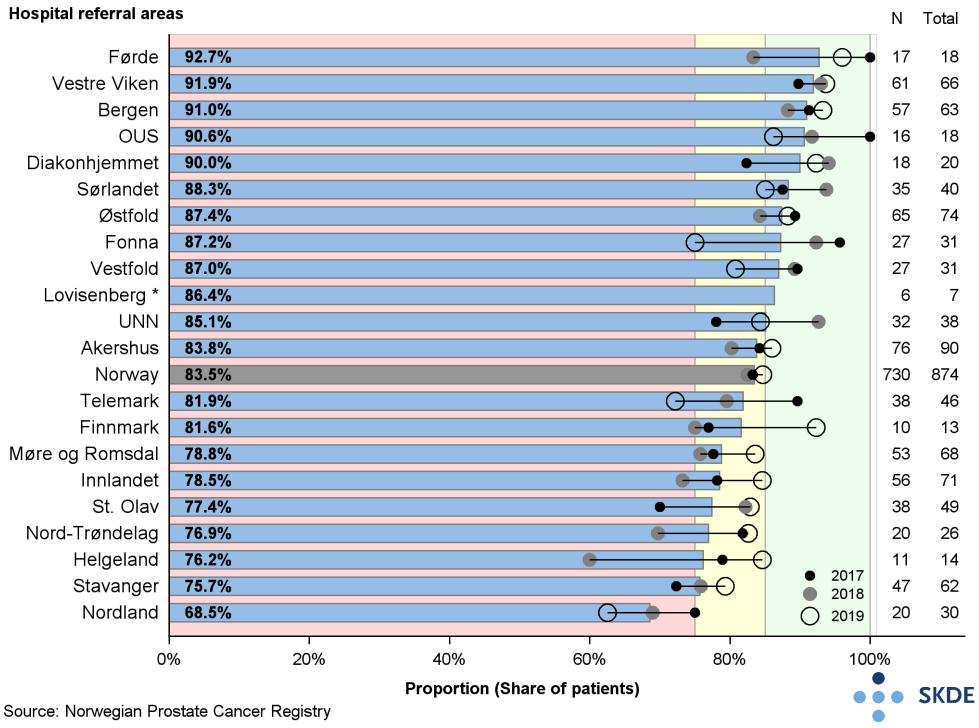

Figure 3.28: Prostate cancer. Proportion of men showing a clear surgical margin, pT2, broken down by referral area. Bars show average proportions; annual proportions are shown with symbol. Numbers to the right show the number of men with a clear surgical margin (N) and the number of men operated (total relevant cases). Average per year in period 2017-2019. * Referral area has less than 10 cases on average per year.

Regionally, 2 of the 4 regions shows high target attainment in the period. In Health South-East RHA and Health West RHA, 85 % of patients showed a clear surgical margin. Target attainment in Health North RHA and Health Central RHA was moderate, with roughly 78 % of patients resident in these regions showing a clear margin after operational removal of cancerous tumours from the prostate gland in the period. The results were stable except for Health West RHA, which had a higher proportion of patients with clear margin in 2019 by comparison with 2017 and 2018. Nationally, the target attainment was moderate, with the proportion of patients showing a clear margin being stable at roughly 84 %.

Discussion of results

Prostate cancer can have very different pathways in different persons, and the treatment of prostate cancer must therefore be customised for each individual patient. There is good quality in the treatment if the patient emerges free of cancer, but because treatment of prostate cancer is particularly associated with the risk of urine incontinence, diarrhoea and impotence, it is not consistent with good quality to offer a therapy to patients that is not beneficial to them.

There are good reasons why surgeons want to use nerve-conserving procedures when operating out cancer tumours within the prostate. The assessment of the patient's suitability for the procedure is an uncertain art. An unclear surgical margin means added risk of relapse, and most often means the patient must receive radiotherapy at a later date, with associated high risk of multiple side-effects and long-term effects. It is possible that some surgeons prefer nerve-conserving procedures more than other colleagues, and that this leads to a lower proportion of patients showing a clear margin in certain referral areas. It would be interesting to explore what linkage there might be between the proportion of Norwegian men with a clear surgical margin and the functional levels of Norwegian men with prostate cancer. The Cancer Registry of Norway has sponsored a research project to compile data on urine incontinence, bowel function and sexual function, but the results so far do not differentiate between patient surgical outcomes with clear and unclear surgical margins.

Individual pathologists assess whether or not a clear margin has been achieved, and how the tissue sample is rated can vary among different pathologists. This is another potential reason for the variations in the results, both between referral areas and between administrative regions.

The results for the quality indicator *proportion high-risk patients receiving radical treatment* showed relatively large regional differences, which may suggest that there are different practices in different parts of the country. There may be good grounds for why high-risk patients are not given radical therapy. The national action program for prostate cancer states in part that general health, morbidity, expected lifetime and the patient's own desires must be taken into account when selecting the course of treatment. A possible cause of lower proportions of radical therapy of high-risk patients may also be that some high-risk patients who were not well enough to tolerate radical radiotherapy, were instead treated using a radiotherapy regime with lower total dose. However, it is expected that factors such as morbidity would be fairly equally spread among the population, and the results suggest therefore that there may have been under-treatment of this patient category in some referral areas. Men with high-risk prostate cancer without spreading who do not take a radical course of treatment after diagnosis have an increased probability of dying due to the disease (Nasjonalt kvalitetsregister for prostatakreft 2020). The reason that some referral areas and regions showed low target attainment for the quality indicator *proportion high-risk patients receiving radical treatment* in the period 2017-2019 should therefore be investigated more fully.

3.3 Diabetes

Type 1 diabetes is an autoimmune disease causing insulin deficiency. It is the body itself that destroys the insulin-producing cells in the pancreas. What causes this destruction is unknown. When 80-90 % of insulin production is lost, the patient experiences symptoms of high blood glucose levels, i.e. increased thirstiness, higher urine volumes, listlessness, and weight loss (Norsk diabetesregister for voksne 2020).

Diabetes is a lifelong illness that can lead to serious complications and reduced quality of life and premature death. Long-term high blood glucose levels will damage the body's small blood vessels, which in turn can cause damage to a number of organs in the body. Such damage develops over many years, but also children and youngsters can develop late complications. High blood glucose level is the most important risk factor in developing late complications such as loss of vision, kidney failure, myocardial infarction, heart failure, stroke, amputations, and premature death in patients with diabetes (Norsk diabetesregister for voksne 2020)

Severely low blood glucose levels (insulin shock where patient is unconscious) and insulin deficiency (diabetic ketoacidosis) can come as acute complications of diabetes. Insulin shock is treated with a subcutaneous or intramuscular injection of glucagon, or alternatively with intravenous glucagon in severe cases. Insufficient insulin in the body can cause high blood glucose levels and diabetic ketoacidosis, which is a very serious and potentially deadly condition that usually requires hospitalisation. The patient is then treated by administering liquids and insulin.

3.3.1 Type 1 diabetes in children and youth

Figure 3.29 shows the number of children and youth per year who received treatment for type 1 diabetes in the specialist health service per 1,000 population (patient rate). The patient rate varied from approximately 3.5 per 1,000 population for those living in the Førde referral area, to just under 2 patients per 1,000 population for those living in the Oslo referral area.

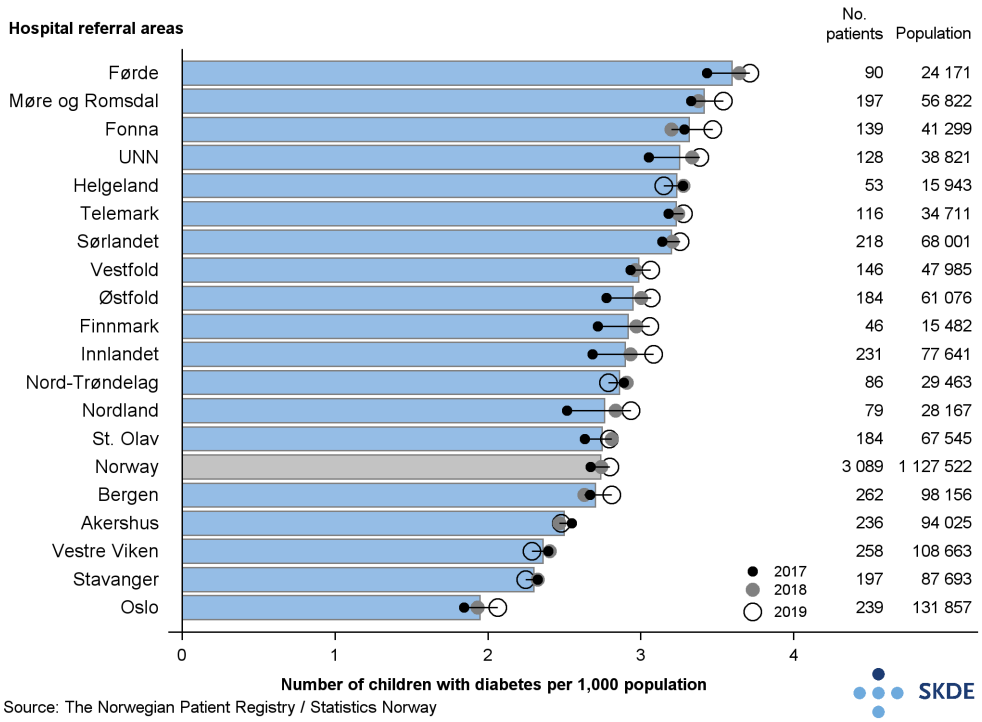

Figure 3.29: The number of children and youth receiving treatment for type 1 diabetes in the specialist health service per 1,000 population, adjusted for age and gender, broken down by referral area. Age 0-17. Bars show average rates; annual rates are shown by a symbol. The numbers to the right of the figure show the number of patients and population, respectively. Average per year in the period 2017-2019.

Type 1 diabetes is the next most common chronic illness in children and youth in Norway, and Norway ranks highest in the world with regard to the occurrence of diabetes diagnosed before the age of 15 (Barnediabetesregisteret 2020). In 2019, 410 new cases of type 1 diabetes in children and youth in the 0-17 age group were reported. The average age at the time of diagnosis of the illness was 7.6 years in 2019, and for diabetes patients attending their annual check-up in 2019, the average age was 12.8 years. Type 1 diabetes represents 96 % of all cases of diabetes in children and youth (Barnediabetesregisteret 2020).

Treatment of diabetes in children and youth is difficult. Most children and youth do not meet international therapy targets with regard to blood glucose level control, one of the main causes being the fear of severely low blood glucose levels (Barnediabetesregisteret 2020). There are some particular challenges linked to the treatment of diabetes in young people, one of them being that hormones during puberty raise the need for insulin, at the same time as children as they grow older often take over more of the responsibility for managing their diabetes. Social conditions, for example that young people want to live like others their age, can complicate treatment even more.

Results

The Norwegian Childhood Diabetes Registry (BDR) has provided data for this chapter. In collaboration with the BDR, three quality indicators were selected to shed light on quality in essential health services. Two indicators show treatment results with regard to how well the patient's blood glucose level is controlled, and one indicator shows the use of continuous glucose monitoring as an aid in controlling blood glucose levels.

Support of the BDR was 100 % in the period 2017-2019, and the national coverage was 98 % through the period. All departments reported over 87 % of their patients for all three years; only two departments participated with fewer than 90 % of their patients.

The results presented in this chapter are for patients between the ages of 0 and 17 with type 1 diabetes.

Long-term blood glucose level (HbA1c)

Monitoring the long-term blood glucose level (HbA1c) is considered the best measure of blood glucose management and the only variable that can be related to risk of developing micro-vascular complications (eye damage, kidney damage, nerve damage) and macro-vascular complications (heart disease, stroke, amputations) (Barnediabetesregisteret 2020). HbA1c reflects the blood glucose level in a 4-12-week period before monitoring. Internationally and nationally, there are guidelines indicating what the long-term blood glucose level in children and youth should be, and this target has been set so as to prevent the development of late complications to the greatest possible extent. Today, it is recommended that HbA1c is below 53 mmol/mol in children and youth aged 0-17 (Barnediabetesregisteret 2020). Før oktober 2018 var behandlingsmålet at HbA1c for barn og unge skulle være under 58 mmol/mol.

Up until October 2018, the aim of therapy was that HbA1c in children and youth should be below 58 mmol/mol.

The BDR has two quality indicators measuring how well the patient's blood glucose level is managed: *proportion of patients with HbA1c below 53 mmol/mol* and *proportion of patients with HbA1c higher than or equal to 75 mmol/mol.* HbA1c below 53 mmol/mol indicates that the patient's blood glucose level is under very good control, whereas HbA1c higher than 75 mmol/mol indicates poor blood glucose level control, which increased the risk of developing late complications considerably.

High target level for the quality indicator *HbA1c below 53 mmol/mol* has been set by the Registry Advisory Board at minimum 40 % of patients with HbA1c below 53 mmol/mol. The moderate target level is set at 20-39 %, and the low target level is below 20 %.

As figure 3.30 shows, none of the referral areas achieved a high level of target attainment for the quality indicator *proportion of patients with HbA1c below 53 mmol/mol*, based on the overall result in the period 2017-2019. Seventeen out of the 19 referral areas have a moderate level of target attainment.

Generally speaking, the development was positive for the great majority of referral areas. A significantly higher proportion of patients had HbA1c below 53 mmol/mol in 2019 compared to 2017. The Fonna referral area had the highest proportion of very well controlled patients, but an average target attainment of about 35 %. Fonna and St Olav both showed high target attainment in 2019. Of patients living in these referral areas, 40 % and 44 % respectively, had HbA1c below 53 mmol/mol in the last year of the period. The Bergen and Telemark referral areas showed

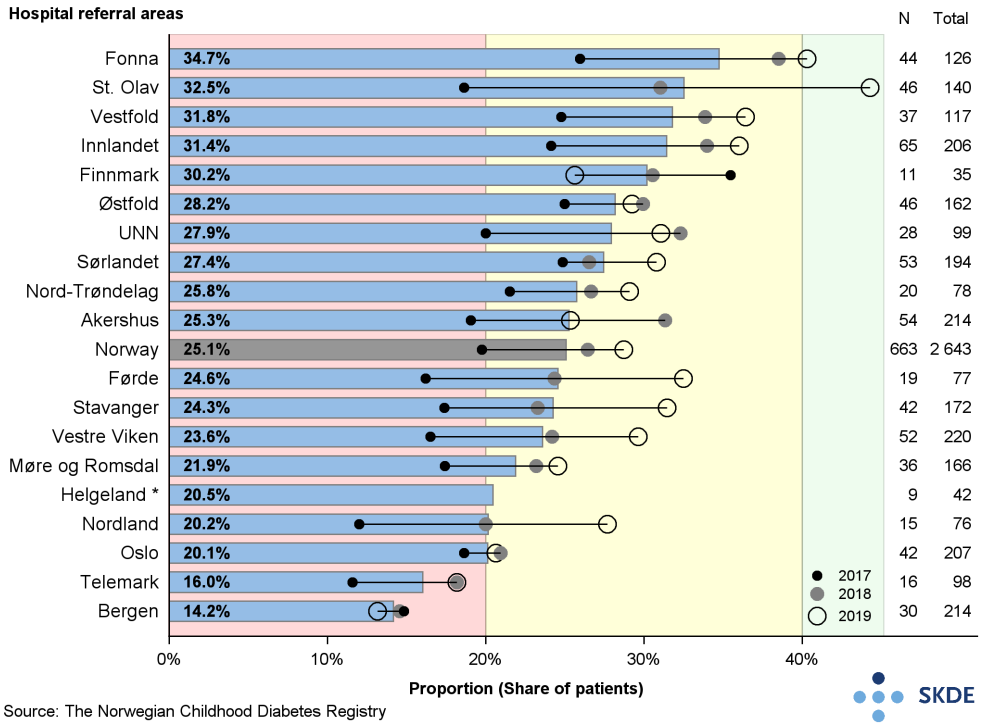

Figure 3.30: Type 1 diabetes in children and youth. Proportion of patients with long-term blood glucose level (HbA1c) below 53 mmol/mol, broken down by referral area. Age 0-17. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients with HbA1c below 53 mmol/mol (N) and the number of patients with type 1 diabetes (total relevant cases). Average per year in the period 2017-2019. * Referral area has less than 10 cases on average per year.

low target attainment during the period. Of patients living in these referral areas, 14 % and 16 % respectively, had HbA1c below 53 mmol/mol. In addition, the annual variation for Bergen showed a development towards a lower proportion of target attainment during the same period. Telemark had a positive development from 2017 to 2018, while the proportion of patients with HbA1c below 53 mmol/mol was stable at about 18 % for this referral area from 2018 to 2019.

Regional differences were smaller, as all regions showed moderate target attainment in the period 2017-2019. Health Central RHA had the highest proportion of very well controlled patients during the period, with 27 %. Health West RHA had the lowest proportion; 23 % of patients living in this region had HbA1c below 53 mmol/mol in the same period. All regions had a positive annual development, both from 2017 to 2018 and from 2018 to 2019. The greatest development was from 2017 to 2018. All regions had approximately 7 percentage points higher proportion of very well controlled patients in 2018 compared to 2017. At a national level, some 25 % of patients had HbA1c below 53 mmol/mol in the period analysed as a whole, and above 30 % achieved their treatment target in 2019.

Few children and youth with diabetes have HbA1c above 75 mmol/mol, and the small amount of data makes it difficult to present the proportion of patients with HbA1c above 75 mmol/mol per referral area. The Centre for Clinical Documentation and Evaluation (SKDE) has therefore chosen to turn the indicator around, so that Figure 3.31 shows the proportion of patients with Hba1c below 75mmol/mol, instead of the proportion of patients with HbA1c higher than or equal to 75mmol/mol, which is the usual way of presenting results for this indicator. High target level

for the quality indicator HbA1c below 75 mmol/mol has been set by the Registry Advisory Board at HbA1c below 75 mmol/mol in minimum 95 % of patients. Moderate target level is set at 90-95 %, and low target level is below 90 %.

The average result for the period 2017-2019 shows that 2 of the 19 referral areas achieved high target attainment for the quality indicator *proportion of patients with HbA1c below 75 mmol/mol.* Nine referral areas had a moderate target attainment, whereas the remainder 8 referral areas had low target attainment for this indicator in the same period. Thus, there were geographical differences in target attainment. In the Vestfold and Førde referral areas, about 4 percent of the patients had HbA1c higher than or equal to 75 mmol/mol, compared to 16-17 % of patients in the Finnmark and Akershus referral areas. Neither Finnmark nor Akershus had a positive development in the period, but note that the small amount of data for Finnmark renders the result somewhat uncertain for this referral area. At the regional level, there were small percentage differences, both for the period analysed as a whole and for individual years. Health Central RHA on average had a moderate target attainment with a proportion of 90.7 %, while the other regions had a low target attainment with a proportion of just under 90 %. Nationally, the target attainment was low. The proportion of patients with long-term blood glucose levels below 75 mmol/mol was stable at approximately 89 % in the period. Thus, at the national level, some 11 % of patients had higher HbA1c than recommended in the period 2017-2019.

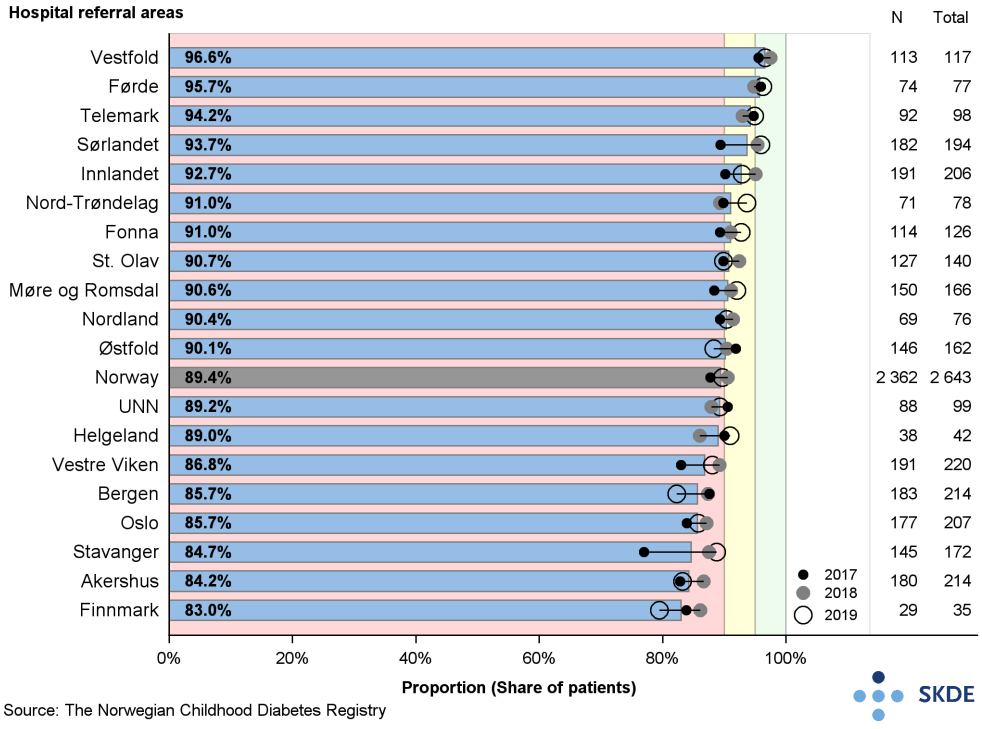

Figure 3.31: Type 1 diabetes in children and youth. Proportion of patients with long-term blood glucose level (HbA1c) below 75 mmol/mol, broken down by referral areas. Age 0-17. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients with HbA1c below 75 mmol/mol (N) and the number of patients with type 1 diabetes (total relevant cases). Average per year in the period 2017-2019.

Use of glucose sensor (continuous glucose meter - CGM)

A continuous glucose meter (CGM) is a small metering device that continuously monitors the glucose level in the interstitial fluids under your skin. A CGM is used in combination with an insulin pump or insulin pen and can be programmed to trigger an alarm if the level of glucose is too high or too low. Using a CGM can make it easier for the patient to monitor and control his or her blood glucose level. Norwegian children and youth using CGM in 2019 had a statistically significant better HbA1c than those not using CGM (Barnediabetesregisteret 2020). No high, moderate or low target level for use of CGM has been defined.

Figure 3.32 shows that there were major developments in the use of CGM in the period 2017-2019. There was an increase in the proportion of patients using CGM for all referral areas, and therefore also nationally: the proportion of patients using CGM was 25 percentage points higher in 2019 than in 2017. The use of CGM varied. Of the patients living in Nord-Trøndelag, 86 % used CGM in the period, compared to 52 % in the Finnmark and 54 % in the Oslo referral area, respectively. The small amount of data for Finnmark means that interpretation of the result is uncertain. There was also variation in the use of CGM among regions. Health South-East RHA had the lowest proportion of patients using CGM in the period; some 60 % of patients living in this region used CGM, compared to 75 % of patients living in the Central Norway Regional Health Authority. For the other regions, the proportion of patients using CGM was approximately 64 % for the period analysed as a whole. In 2019, 85 % of patients in Health Central RHA used CGM. The result for South-East RHA, which was the region with the lowest proportion of target attainment in 2019, was 70 % by comparison. The results for 2019 for Health North RHA and Western Norway Regional Health Authorities, were 75 % and 78 %, respectively.

Discussion of results

The results show that there was geographical variation in the treatment of type 1 diabetes in children and youth in the 2017-2019. There were significant differences among the referral areas, both with regard to the proportion of patients with a very well controlled blood glucose level, and the proportion of patients whose blood glucose level was under poor control.

A number of the same referral areas had low target attainment for several of the indicators discussed in this chapter. For example, Finnmark had the highest proportion of patients with high long-term blood glucose level (HbA1c), and the lowest proportion of CGM use. The HbA1c level has been shown to be significantly better in children using CGM (Barnediabetesregisteret 2020), and increasing the use of CGM will therefore serve to reduce the proportion of children with poorly controlled blood glucose levels. Considering the risk of late complications associated with poorly controlled blood glucose level in persons with diabetes, it is important that children and youth are offered equitable therapy and good quality treatment. The annual variation in Figure 3.32 shows that over 80 % of patients in Nord-Trøndelag were using CGM as early as 2017, at the same time as many referral areas were still far away from this level in 2019. These results show variations in how diabetes is treated, and the causes of these variations should be examined more closely.

However, there was no clear correlation between the proportion of CGM use and HbA1c level for all referral areas. For example, Bergen had a relatively high proportion of CGM use, but also a high proportion of patients with poorly controlled HbA1c. The use of CGM or other aids in diabetes therapy is not a guarantee for well-controlled blood glucose levels, and therefore the correlation cannot be expected to be unambiguous for all patients.

In order to achieve good results in the treatment of children and youth with diabetes, follow-up

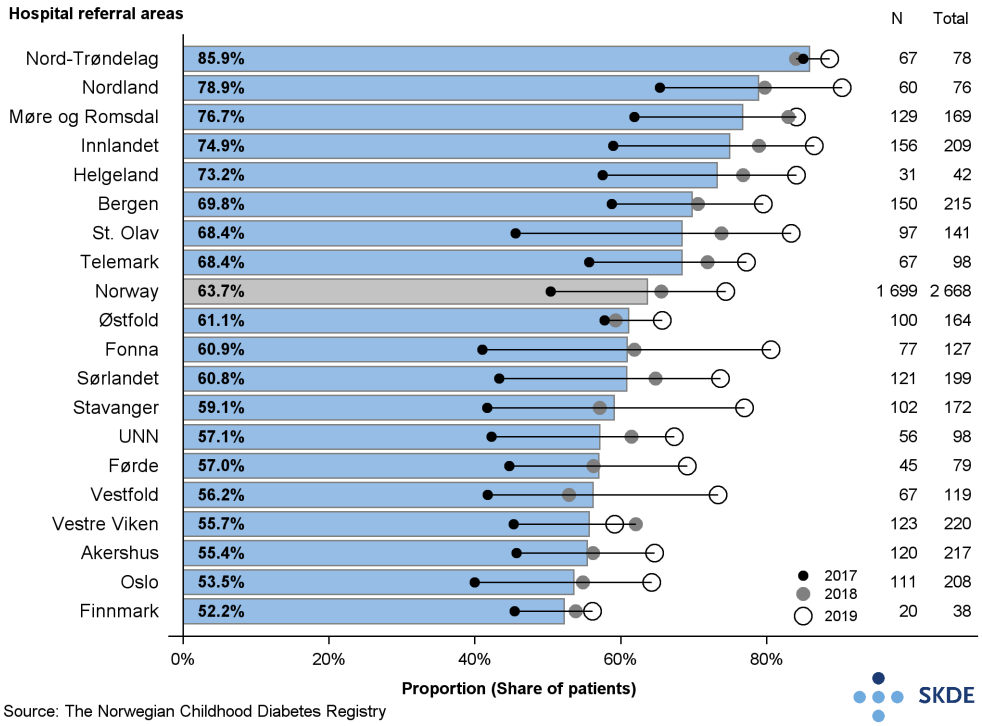

Figure 3.32: Type 1 diabetes in children and youth. Proportion of patients using CGM, broken down by referral area. Age 0-17. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients using CGM (N) and the number of patients with type 1 diabetes (total relevant cases). Average per year in the period 2017-2019.

in the healthcare service must be good, at the same time as the parents and child have a difficult task when it comes to complying with recommendations from healthcare services at home. Thus, low target attainment may be due to patients not adequately being followed up by the healthcare service, but also that follow-up by patient and family is inadequate.

Long travel to specialised treatment can also be a challenge, for example for patients in Finnmark. Children living in Finnmark are offered to have some of their diabetes check-ups done at their GP (Finnmarkssykehuset 2020), so that they do not have to travel to a hospital with a specialised therapeutic team. Living far from a hospital and the opportunity to receive specialised follow-up, can be a quality challenge in the treatment of diabetes.

3.3.2 Type 1 diabetes in adults

Type 1 diabetes affects approximately 0.6 % of the Norwegian population. Early coronary heart disease is the most common cause of reduced lifespan and increased pathological burden in people with diabetes, though complications associated with diseases of the eyes, kidneys and nervous system also contribute significantly to loss of health in these patients (Norsk diabetesregister for voksne 2020).

Diabetes is the most common cause of amputations not due to acute trauma, and diabetes is one of the most important causes of acquired blindness and severe kidney failure in Norway (Norsk diabetesregister for voksne 2020). Major parts of the costs of diabetes care are linked to the treatment of complications. It is well established that good diabetes treatment prevents or delays the development of such complications.

Results

The Norwegian Diabetes Registry for Adults has provided data for this chapter. In collaboration with the Registry, the indicators *long-term blood glucose level below or equal to 53 mmol/mol* and *long-term blood glucose level below 75 mmol/mol*, and the *proportion of patients undergoing screening during their annual check-up for various parameters* were selected to shed light on quality in essential health services.

The quality of the data in the Norwegian Diabetes Registry for Adults was a challenge in the period 2017-2019, due to the lack of support from some hospitals. An account of this is found in Appendix A. There are no valid data for 2017 for the Central Norway Regional Health Authority. Thus, the figures do not show results for 2017 for the referral areas in the Central Norway Regional Health Authority, and the average for the referral areas in question has been estimated based on the results for 2018 and 2019.

Long-term blood glucose level

Chapter 3.3.1, Type 1 diabetes in children and youth accounts for long-term blood glucose level (HbA1c).

High target level for the quality indicator *proportion of patients with HbA1c below or equal to 53 mmol/mol* has been set by the Registry Advisory Board at HbA1c below or equal to 53 mmol/mol in minimum 25 % of patients. A moderate target level is achieved if 20-25 5 of patients reach their therapeutic target, and a low target level is a proportion of less than 20 %.

As shown by Figure 3.33, target attainment for the quality indicator *long-term blood glucose level below or equal to 53 mmol/mol* was generally high. The average for the period shows that 15 of 21 referral areas achieved high target attainment for this indicator, 5 referral areas had moderate target attainment, and 1 referral area had low target attainment. Throughout the period, there was a positive development towards a greater proportion of patients having HbA1c below or equal to 53 mmol/mol, and the annual variation shows that 18 of 21 referral areas achieved high target level in 2019.

At the same time, there were significant differences among referral areas. The Førde referral area on average had an 18 percentage points higher proportion of patients with HbA1c below or equal to 53 mmol/mol compared to the østfold referral area, which was the only referral area with low target attainment for this indicator. The proportion of patients with HbA1c below or equal to 53 mmol/mol was also close to twice as high in Førde as in østfold in the period. The Finnmark referral area had moderate target attainment in the period, but even so the proportion

of patients with HbA1c below or equal to 53 mmol/mol was low in Finnmark compared to other referral areas and the national average. Finnmark showed a positive development in 2019, where the proportion of patients with HbA1c below or equal to 53 mmol/mol approached a high level.

All regions achieved high target attainment for this indicator in the period 2017-2019. Health North RHA, which was the region with the lowest proportion of patients with long-term blood glucose levels below or equal to 53 mmol/mol, had an average result of 25 %. There was positive development in Health North RHAin the period, as the proportion of patients with low long-term blood glucose levels rose from around 22 % in 2017 to around 27 % in 2019. Health West RHA and Health Central RHA had the highest proportion of patients with long-term blood glucose levels below or equal to 53 mmol/mol; on average 29 % of patients living in these regions had HbA1c below or equal to 53 mmol/mol in the period.

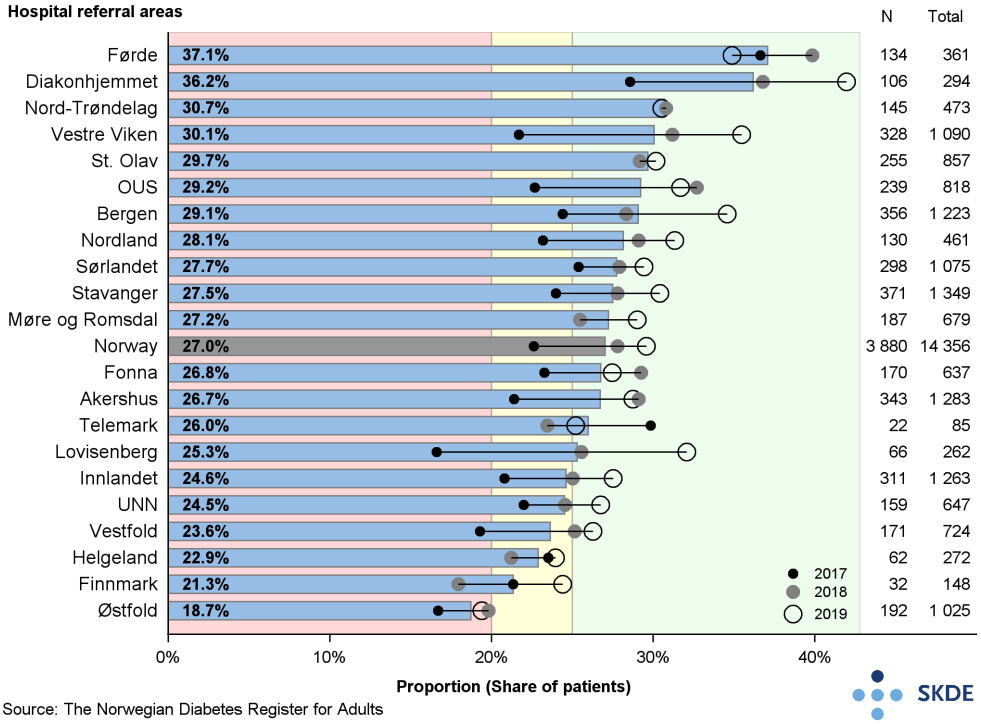

Figure 3.33: Type 1 diabetes in adults. Proportion of patients with long-term blood glucose level (HbA1c) below or equal to 53 mmol/mol, broken down by referral area. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients with HbA1c below or equal to 53 mmol/mol (N) and the number of patients with type 1 diabetes (total relevant cases). Average per year in the period 2017-2019.

The Centre for Clinical Documentation and Evaluation (SKDE) has therefore chosen to show the proportion of patients with Hba1c below 75mmol/mol, instead of the proportion of patients with HbA1c higher than or equal to 75mmol/mol, which is the usual way of presenting results for this indicator. For a more detailed explanation of this, see subsection 3.3.1.

The Registry Advisory Board has set the high target level at HbA1c below 75 mmol/mol for minimum 85 % of patients, a moderate target level is set at 80-85 %, and a low target level is below 80 %. Thus, high quality in the treatment of diabetes means that 15 % or less of patients should have a high long-term blood glucose level.

As Figure 3.34 shows, only 2 of the referral areas achieved high target attainment in 2017.

However, the trend was positive as 13 of 21 referral areas reached high target level in 2019, and all referral areas for which data exist had a lower proportion of patients with long-term blood glucose levels higher than or equal to 75 mmol/mol in 2019 compared to 2017. All referral areas as a minimum reached a moderate target level in 2019, but the average result for the period 2017-2019 showed significant differences among referral areas. Approximately 9 % of patients living in the Diakonhjemmet referral area had long-term blood glucose levels higher than or equal to 75 mmol/mol, compared to approximately 20 % in østfold, Finnmark, Telemark, Helgeland, and the University Hospital of North Norway (UNN). Regionally, Health North RHA had the lowest proportion of patients with long-term blood glucose levels below 75 mmol/mol, with an average of 82 %. Thus, the target attainment for this region was moderate. In Health West RHA and Health Central RHA the target attainment was high; on average approximately 86 % of patients living in these regions had HbA1c below 75 mmol/mol. Health North RHA showed the greatest improvement from 2017 to 2019, with a drop in the proportion of patients with long-term blood glucose levels higher than or equal to 75 mmol/mol of about 5 percentage points in 2019 compared to 2017.

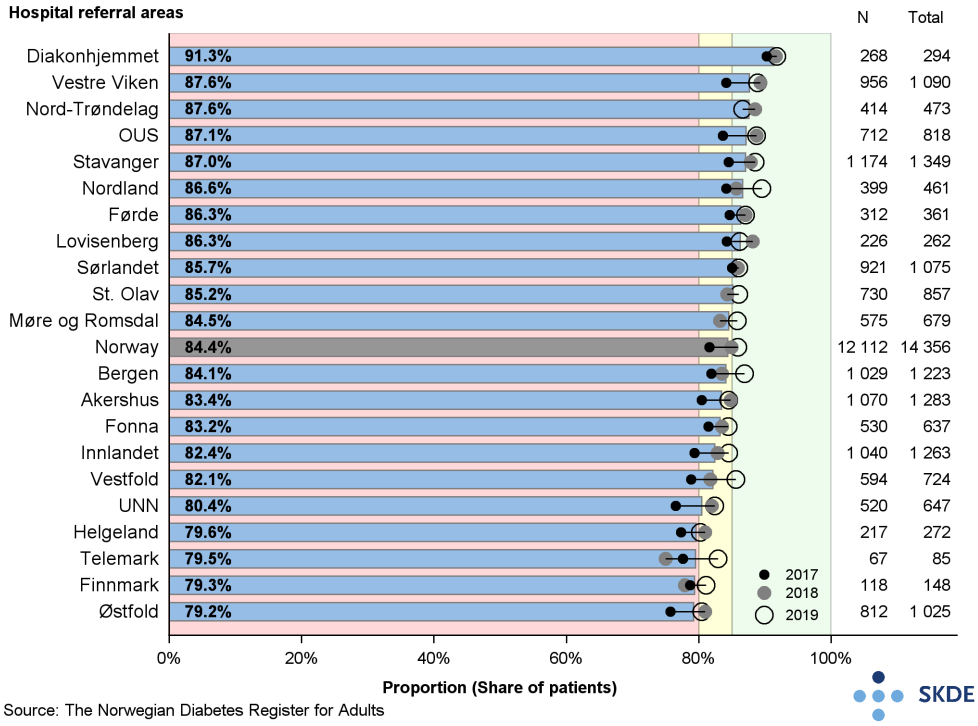

Figure 3.34: Type 1 diabetes in adults. Proportion of patients with long-term blood glucose level (HbA1c) below 75 mmol/mol, broken down by referral area. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients with HbA1c below 75 mmol/mol (N) and the number of patients with type 1 diabetes (total relevant cases). Average per year in the period 2017-2019.

Screening during annual check-up (seven procedures performed)

It is important to screen patients for diabetes complications so that any complications can be detected at an early stage, when it is still possible to intervene in order to reverse or prevent progression of complications. It is recommended that all patients undergo minimum one check-up per year, during which a number of different measurements are taken to monitor the patient's health condition with a view to preventing or stopping the progression of complications that are

manifest (Norsk diabetesregister for voksne 2020). Measuring albumin in urine can indicate kidney damage in progress, and the Norwegian Directorate of Health's guidelines therefore recommend annual measurement of urinary albumin. The guidelines recommend examining the eyeground to check for eye damage under development at least every other year. In addition, the patient's long-term blood glucose level and blood pressure should be checked and smoking habits mapped on an annual basis. The LDL blood cholesterol level should also be checked, with a view to preventing coronary heart disease.

Figure 3.35 shows that the proportion of patients undergoing screening procedures varies among the referral areas. Nordland had the highest proportion of screening procedures performed, assessed on the basis of the aggregate result. Some 90 % of all screening procedures in this referral area were performed, compared to 75 % in the Telemark referral area, where the lowest proportion of screening procedures was performed. In most referral areas, most patients had their HbA1c and LDL cholesterol checked, a somewhat lower proportion had their blood pressure (BP) checked and smoking habits mapped, while fewer patients had their feet, urinary micro-albumin and eyeground examined.

Figure 3.35: Type 1 diabetes in adults. Proportion of screening procedures performed (0-100 %, dotted lines for each 20 %), broken down by referral area. Average in the period 2017-2019.

Discussion of results

Good control of patient's long-term blood glucose levels is one of the most important policies to reduce the risk of late complications of diabetes (Norsk diabetesregister for voksne 2020). The results discussed in this chapter are not adjusted for age and gender, but the same analyses have been reviewed after making the adjustment, without this changing the results to any noticeable extent. Different population demographics therefore cannot explain that some referral areas had a higher proportion of patients with poor control of long-term blood glucose levels than others. The results show that several of the same referral areas had the lowest result for both indicators measuring how well controlled the patient's blood glucose level is. Thus, there were several of the same referral areas that had a high proportion of patients with high blood glucose levels that had a lower proportion of patients with a very well controlled long-term blood glucose level.

There could be many reasons for the geographical variation in quality discussed in the results

chapter. Patient lifestyle and adherence to advice concerning control of blood glucose levels are of great importance to therapeutic target attainment, and some referral areas may have had bigger challenges helping patients comply with recommendations than others. It is also possible that distance to specialised diabetes treatment for instance in Finnmark, was important with regard to patient follow-up, and thus also with regard to how well the patient's diabetes was controlled. At the same time, the results for the screening procedures show that an acceptable proportion of patients in Finnmark, which is a referral area where a lot of patients have a long way to travel to specialised treatment, was followed up with regular check-ups in the period 2017-2019.

The results show that target attainment for important indicators were low in some referral areas, and that there was geographical variation in the quality of diabetes treatment in the period 2017-2019. On the other hand, the hospitals in some of the referral areas with the lowest proportion of target attainment have reported a low proportion of their patients to the Diabetes Registry, and selection bias may therefore have affected the results. It is also possible that use of the primary health service in diabetes treatment may differ in the various referral areas, which may have affected the results as this chapter was written based on data from the specialist health service.

3.4 Other

3.4.1 Hip fractures

Norway has one of the world's highest incidences of hip fractures, where over 8,000 people undergo surgery for hip fractures every year. The rate of hip fractures in the population is dropping, but the number of fractures is nevertheless expected to rise in the years to come, due to an ageing population. The average age of people undergoing hip surgery is 82 for women and 77 for men. Approximately 70 % of those operated for hip fracture are women (Nasjonalt hoftebruddregister 2020).

Hip fractures can have serious consequences for the individual, including skeletal pain, reduced mobility, increased need for assistance and shorter lifespan. In addition, there are the economic costs for society associated with treatment and care. The healthiest hip fracture patients manage well, but the average age for hip fractures is 80 years, and a lot of hip fracture patients have additional illnesses causing an increased risk of complications and death. This is contributing to the one-year and five-year mortality rate for hip fracture patients being 23 % and 56 % respectively in 2019 (Nasjonalt hoftebruddregister 2020). Through good quality in treatment, for example by using the recommended surgical method and operating quickly, it is possible to achieve better treatment results for hip fracture patients.

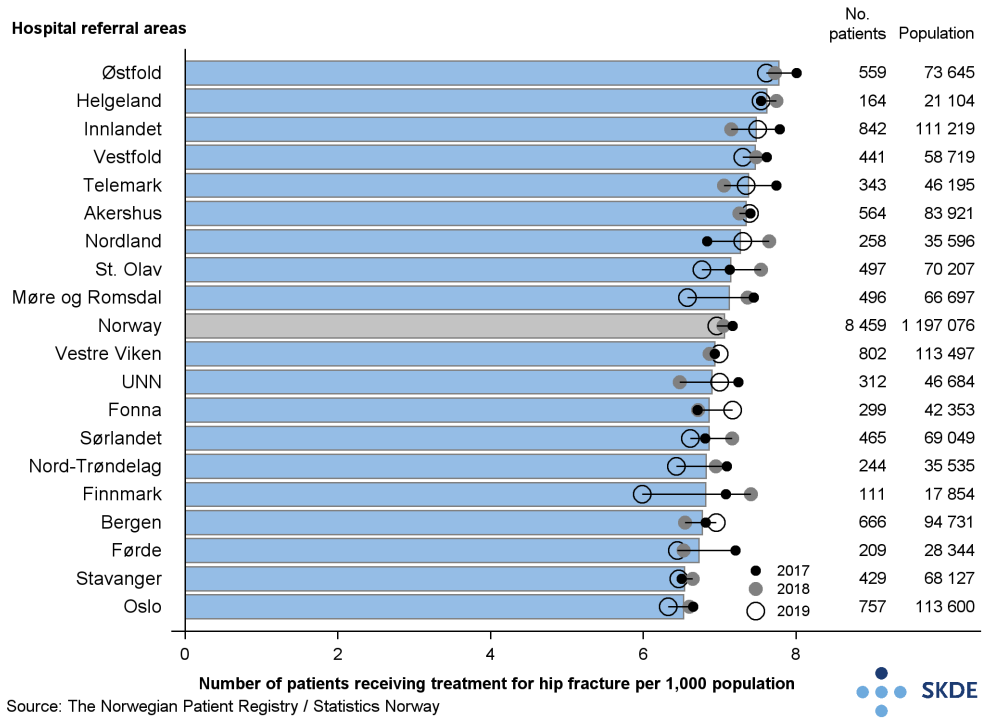

Figure 3.36: The number of patients receiving treatment for hip fracture per 1,000 population, adjusted for age and gender, broken down by referral area. Age 60 years and older. Bars show average rates; annual rates are shown by a symbol. The numbers to the right of the figure show the number of patients and population, respectively. Average per year in the period 2017-2019.

Figure 3.36 shows the annual number of people 60 years or older who were treated for hip fracture per 1,000 population (patient rate), broken down by referral area in the period 2017-2019. There was no significant variation in the patient rate across referral areas in this period.

Results

In cooperation with the Norwegian Hip Fracture Registry, we have selected the indicators *Use of cemented stem prosthesis as treatment for dislocated femoral neck fracture in patients older than 70 years of age;* and *Surgery within 48 hours after fracture and average pre-operative hospitalisation* in order to shed light on the quality of essential healthcare services. In addition, we show results for data reported by patients on changes in walking function following hip fracture surgery.

The Norwegian Hip Fracture Registry has provided data for this chapter. The Registry had 100 % support from relevant hospitals in the period, and the coverage for primary surgery, osteosynthesis, partial prosthesis and full prosthesis, was 88 %, 94 % and 91 %, respectively, for the period 2017-2019.

Use of cemented stem prosthesis as treatment of dislocated femoral neck fracture in patients older than 70 years of age

Dislocated femoral neck fractures are femoral neck fractures with a significant dislocation at the location of the fracture, namely protrusion of the femoral head relative to the femoral neck. This type of fracture makes up roughly 40 % of all hip fractures (Nasjonalt hoftebruddregister 2020). The majority of such fractures are operated using a hemi-prosthesis, where the femoral head is replaced by an artificial ball. There are various ways of fastening the prosthesis: with the cementation technique, the prosthesis stem is fixed to the bone with bone cement; with the uncemented technique, the surgeon wedges the prosthesis stem into a fixed position so that the surface of the prosthesis grows into the bone tissue in due course. National guidelines recommend that patients older than 70 years of age be treated with a cemented stem prosthesis implant. This has been shown to give a lower risk of re-operation and complications (Nasjonalt hoftebruddregister 2020). High target level for this indicator has been set by the Registry Advisory Board at minimum 90 % of patients older than 70 years of age with a dislocated femoral neck fracture being operated with a cemented stem prosthesis. The moderate target level is set at 80-90 %, and low target level is below 80 %.

As Figure 3.37 shows, there was geographical variation in the quality of treatment for the quality indicator *use of cemented stem prosthesis as treatment of dislocated femoral neck fracture in patients older than 70 years of age* in the period 2017-2019. Sixteen of the referral areas had either high or moderate target attainment, assessed on the basis of the aggregate results in the period, while 3 referral areas, namely Sørlandet, Førde and UNN, stood out with a low target attainment for this quality indicator. For patients living in these 3 referral areas, the proportion with cemented stems was roughly 50-60 % in the period, compared to up to 100 % in several other referral areas. According to the annual report for the Norwegian Hip Fracture Registry, the proportion of cemented stems varied a lot for different hospitals in the UNN and Sørlandet referral areas in the period 2017-2019. For the UNN referral area, the UNN Tromsø hospital had a proportion of 0 to 2 % cemented stems in the period 2017-2019, while the two other hospitals in this referral area, UNN Harstad and UNN Narvik, had approximately 100 % cemented stems in the same period. Sørlandet Hospital Kristiansand increased its proportion of cemented stems from 13 % in 2017 to approximately 50 % in 2019. By comparison, Sørlandet Hospital Flekkefjord had a proportion of approximately 80 % cemented stems in 2019.

There was a positive trend for the Førde referral area. Some 75 % of patients living in this referral area were operated with cemented stems in 2019, compared to roughly 25 % in 2018. The Innlandet and Oslo referral areas had moderate target attainment in 2017, but the use of

cemented stems increased considerably in these referral areas in 2018 and 2019, so that high target attainment level for this indicator was reached for the last two years of the period. For the period as a whole, Health North RHA and Health South-East RHA had a moderate target attainment of 82 % and 89 %, respectively, and Health West RHA and Health Central RHA achieved high target attainment, where 91 % and 98 %, respectively, of patients with dislocated femoral neck fracture living in the referral areas of these Regional Health Authorities underwent cemented stem surgery. Nationally, the target attainment was high during the last year of the period, but moderate during the period as a whole.

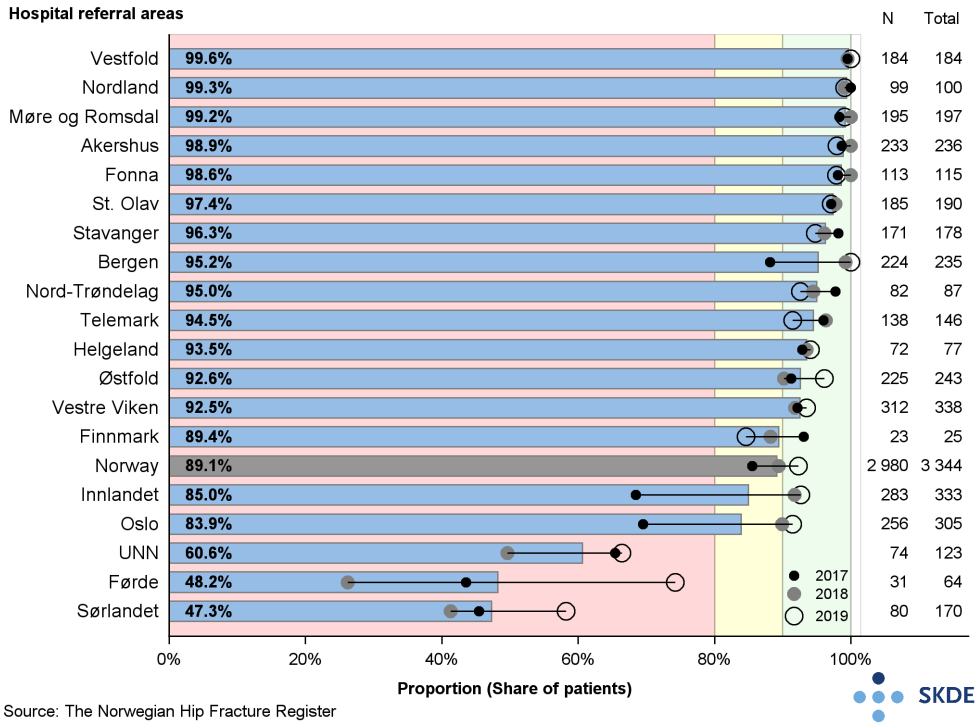

Figure 3.37: Hip fractures. Proportion of patients with dislocated femoral neck fracture receiving a cemented stem prosthesis, broken down by referral area. Older than 70 years of age. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients operated with cemented stem (N) and the number of patients operated for dislocated femoral neck fracture (total relevant cases). Average per year in the period 2017-2019.

Surgery within 48 hours of fracture and average pre-operative hospitalisation

In 2014, the Norwegian Institute of Public Health recommended that hip fractures should be operated within 24 hours (National Clinical Guideline), and no later than 48 hours after the time of the fracture (National Quality Indicator for Hip Fractures) in order to reduce the mortality and risk of medical complications (Nasjonalt hoftebruddregister 2020). In this section, the proportion of patients being operated within 48 hours after the time of fracture as well as average pre-operative hospitalisation are described for the various referral areas. Waiting period from hospitalisation to operation can to a greater extent be used to assess the hospitals' treatment of patients, while the period from fracture to operation is more influenced by how far away from the hospital the patient lives, because some time will be spent on transport. High target attainment level for the quality indicator *operated within 48 hours after the time of the fracture* is achieved if minimum 90 % of patients are operated within 48 hours. A moderate and low target attainment level for

this indicator is set at 80-90 % and below 80 %, respectively. No target level for waiting period in hospital has been defined.

Figure 3.38 shows that there was geographical variation in target attainment for the quality indicator *Operated within 48 hours after fracture* in the period 2017-2019. The Telemark referral area achieved high target attainment for the period seen as a whole. Fifteen of the referral areas had moderate target attainment, while 3 referral areas, namely UNN, østfold, and Akershus, had low target attainment. The proportion of patients operated within 48 hours after fracture varied from 75 % in the Akershus referral area, with the lowest proportion, to 90 % in the Telemark referral area. The results were stable for most referral areas through the period. Thus, there was no clear trend towards a significantly greater proportion of patients being operated within 48 hours. Regionally, target attainment was moderate. The proportion of patients operated within 48 hours was lowest in Health North RHA, with an average of 81 %, and highest in Health West RHA with an average of 86 %. Nationally, target attainment was stable at a moderate target level. Approximately 85 % of patients were operated within 48 hours for all three years.

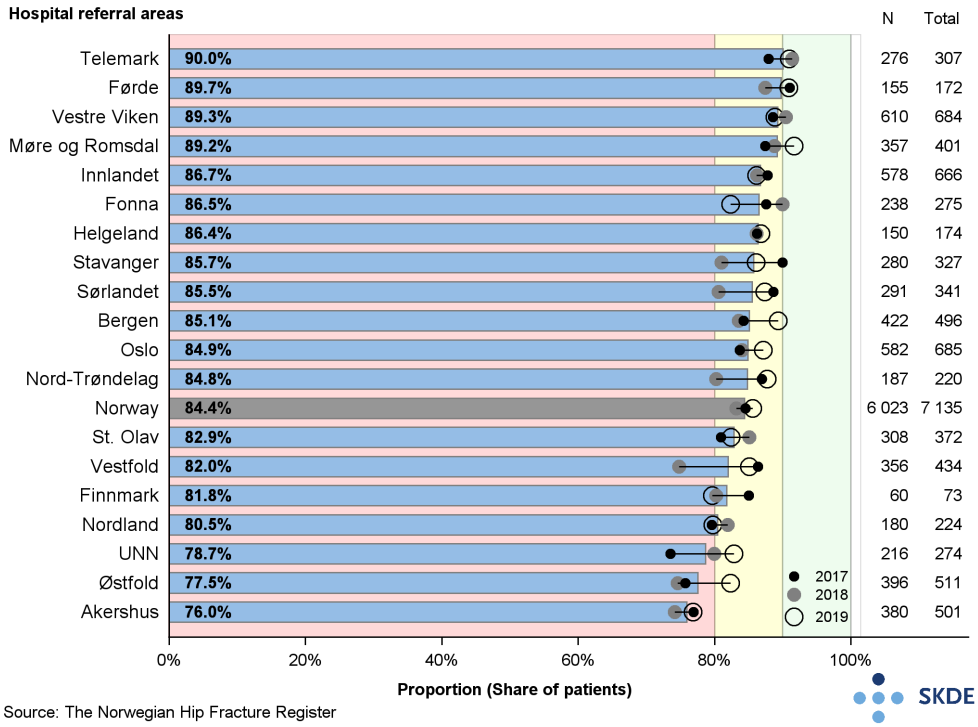

Figure 3.38: Hip fractures. Proportion of patients operated within 48 hours after time of fracture, broken down by referral area. Age 60 years and older. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients operated within 48 hours (N) and the number of patients that were relevant for operation (total relevant cases). Average per year in the period 2017-2019.

Figure 3.39 does not contain data for 2019 because the submission of data from the Norwegian Patient Registry (NPR) for these variables did not arrive in time. Figure 3.39 shows that the average number of hours waiting at hospital before operation varied from 19 hours for patients living in the Møre og Romsdal and Finnmark referral areas, to 33 hours for the østfold referral area, a difference of 14 hours. Nationally, average pre-operative hospitalisation for the period 2017-2018 was 24 hours.

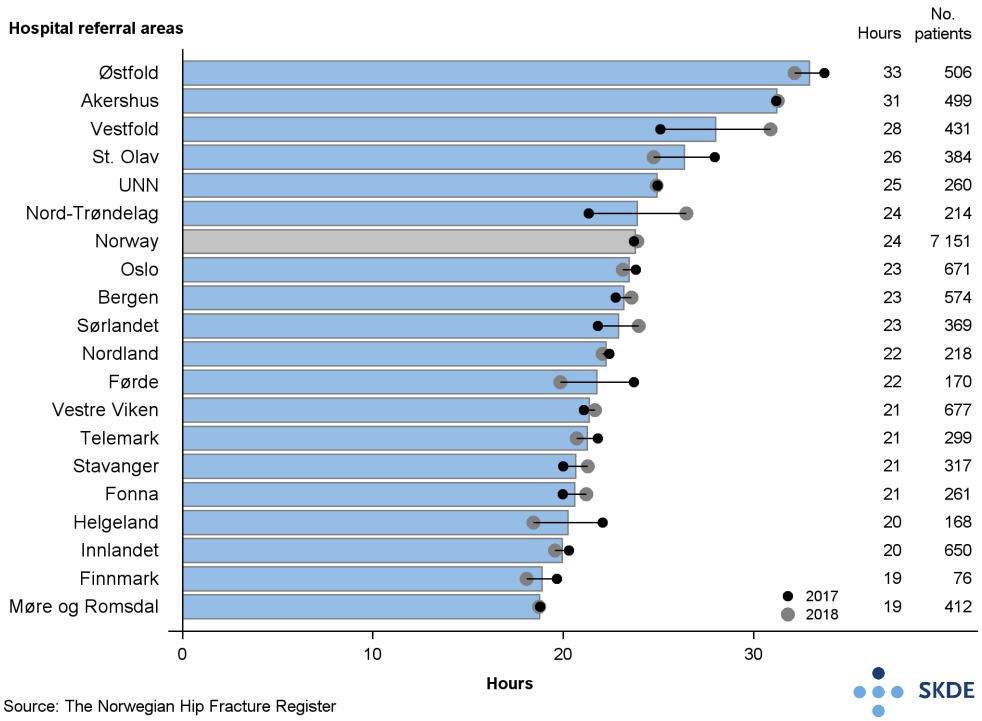

Figure 3.39: Hip fractures. Pre-operative hospitalisation time, broken down by referral area. Age 60 years and older. Bars show average number of hours; annual average is shown by a symbol. The numbers to the right of the figure show pre-operative hospitalisation time (hours) and the number of patients for whom hospitalisation time is given (number). Average per year in the period 2017-2018.

Walking function in patients 60 years or older

A hip fracture is a serious diagnosis that significantly reduces the functional capability of those afflicted. Approximately 37 % of hip fracture patients already have reduced walking function prior to the fracture (Gjertsen et al. 2016), and many patients never return to the same functional level as before the fracture (Nasjonalt hoftebruddregister 2020).

The results presented here show the proportion of patients returning to the same or a higher level of walking function compared to before the fracture. The analysis is based on patient-reported data four months after fracture, gathered by the Norwegian Hip Fracture Registry. The response rate for the questionnaire used is roughly 57 %, and the questionnaire is based on the Norwegian version of EQ-5D-3L, which is a tool used to quantify quality of life. EQ-5D-3L gives a very rough assessment of walking function (no difficulty walking, some difficulty walking, or bed-ridden), which is of significance for the assessment of the results of the analysis. No aspirational target level has yet been defined for this indicator.

The proportion of patients preserving or improving their walking function was highest in the Helgeland referral area, where an average of 62 % of patients had preserved or improved their walking function in the period. The proportion of patients with preserved or improved walking function was 14 percentage points lower in Finnmark than in Helgeland. In this referral area, 48 % of patients preserved or improved their walking function. Small amounts of data for both of these referral areas mean that there is uncertainty associated with the interpretation of results. There were no regional differences for this indicator; both nationally and regionally the result

was stable at just under 60 % in the period. Thus, at the national level, some 40 % of patients had deterioration of walking function four months after hip fracture surgery compared with pre-fracture functionality.

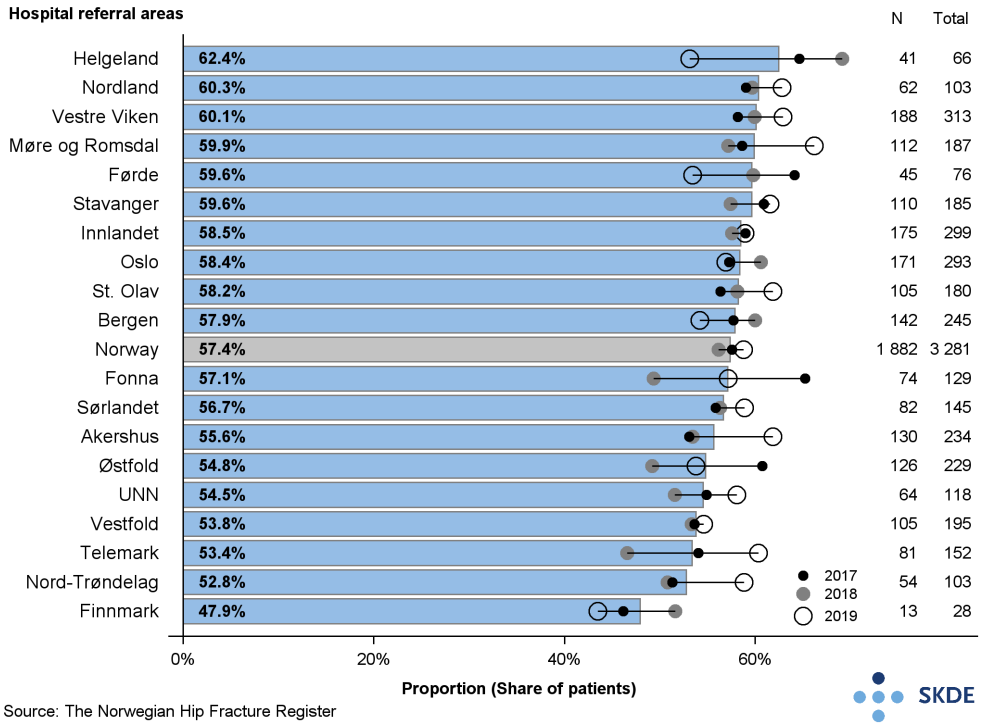

Figure 3.40: Hip fractures. Proportion of patients with same or improved walking function four months after operation, broken down by referral area. Age 60 years and older. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients with preserved or improved walking function (N) and the number of patients responding to the questionnaire (total relevant cases). Average per year in the period 2017-2019.

Discussion

Older people suffer injury more frequently than younger people when they fall, and because older people have a lower functional level, they also have an increased risk of falling. A study from 2016 found that 36 % of hip fracture patients had difficulty walking, and that 1 % were bedridden even before the hip fracture (Gjertsen et al. 2016). Figure 3.40 shows that approximately 40-45 % of hip fracture patients experience reduced walking function four months after hip fracture, compared to before. Among many other things, the level of walking function affects the opportunity to manage on one's own, to live at home, and to reap the joys of a social life. In addition, there is the risk of falling and suffering injury again. In other words, walking function is important both to prevent fall injuries and for the quality of life, and therefore it is worth noting that up to half the patients experienced a deterioration of walking function after hip fracture.

Some surgical techniques to treat hip fractures are associated with poorer results than others, and considering that hip fractures may have serious consequences for a patient's functional level, quality of life and survival, good quality in the surgical treatment of these patients is an important priority focus. For patients older than 70 years of age with a dislocated femoral neck fracture, treatment using a cemented stem prosthesis is recommended (Nasjonalt hoftebruddregister 2020).

Figure 3.37 shows that there was geographical variation in the use of cemented stem prosthesis in the period 2017-2019. These geographical variations were due to some hospitals choosing to operate a large proportion of patients with uncemented prosthesis stems. Such variations in practice can be due to clinical aspirations, the surgeon's preferences, or a fear that bone cement implantation syndrome will occur in the oldest and frailest patients, and the uncemented option is therefore used. The trend during the period showed that many of the hospitals using the uncemented technique for a large proportion of operations in 2017, changed their practice to using the cemented technique to a larger extent towards the end of the period. There were some hospitals still having a very low proportion of cemented stem prosthesis in 2019, which is problematic since uncemented prosthesis stems are associated with an increased risk of new fractures around the prosthesis and the need for re-operation for the over-70 patient group.

In order to reduce mortality and the risk of medical complications, hip fractures should be operated within 24 hours of fracture, or no later than 48 hours after fracture (Nasjonalt hoftebruddregister 2020). The majority of referral areas had a moderate or low target attainment for the quality indicator *operated within 48 hours after fracture*, and at the national level there did not seem to be a trend towards more patients being operated within the deadline during the period. Figure 3.39 shows that patients were hospitalised for 23 hours on average before surgery. Possible causes of this waiting period can be the lack of priority this group of patients get for surgical treatment, or that the patient had other illnesses that had to be examined and possibly treated before surgery. Since the reported waiting times represent an average, there are patients who have waited longer than the results indicate. It is important to take a closer look at the causes of the long pre-op waiting periods in hospital prior to hip fracture surgery.

3.4.2 Chronic kidney disease

Patients with chronic severely reduced kidney function, defined as terminal kidney failure, where the kidneys have less than 15 % of their normal kidney function, may require kidney replacement therapy in the form of dialysis or transplantation to survive (Norsk nyreregister 2020). Terminal kidney failure is a rare, but serious condition. In 2019, some 5,800 live patients were registered in the Norwegian Renal Registry. Of these, approximately 60 % were patients who had undergone a kidney transplant operation, 30 % were dialysis patients, and 10 % had severely reduced kidney function but did not receive renal replacement therapy (Norsk nyreregister 2020).

Nationally, roughly 600 new patients start renal replacement therapy each year. Dialysis is offered at 26 centres throughout the country, and in addition, a hospital dialysis centre can operate dialysis satellites (51 altogether nationwide) at hospitals or healthcare centres nearby. Oslo University Hospital (OUS) has the national responsibility for kidney transplants (Norsk nyreregister 2020).

Figure 3.41 shows the annual number of patients receiving dialysis therapy per 1,000 population (patient rate), broken down by referral area in the period 2017-2019. The patient rate varied from just over 0.2 patients per 100,000 population in Vestfold, to just over 0.5 patients per 1,000 in Nord-Trøndelag. The national patient rate was stable, at just under 0.4 patients per 1,000 population.

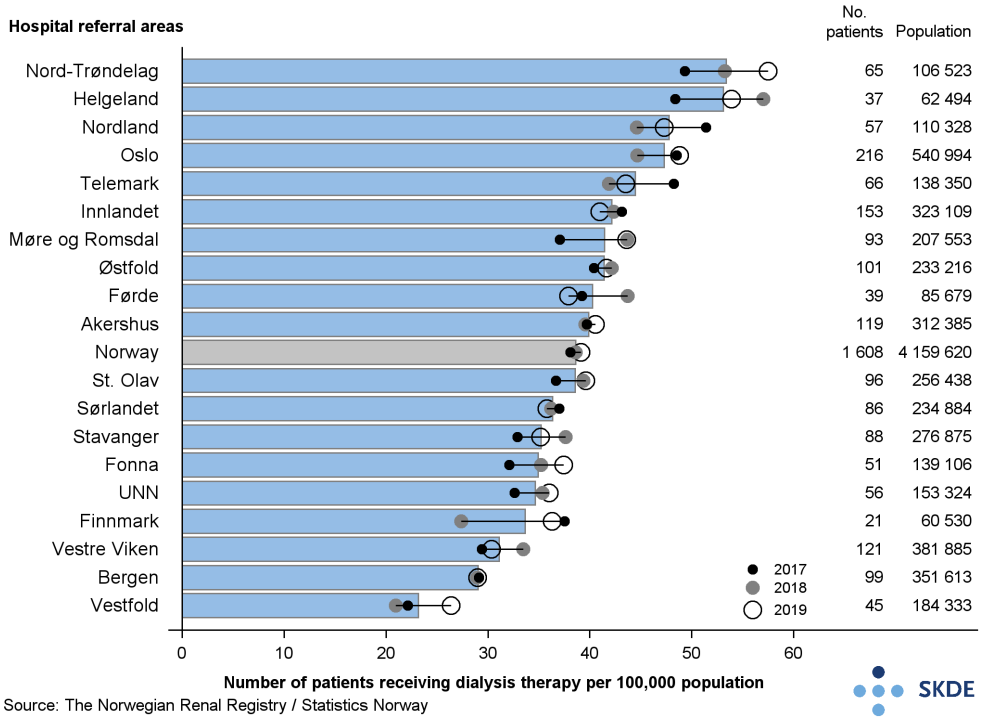

Figure 3.41: The number of patients receiving dialysis therapy per 1,000 population, adjusted for age and gender, broken down by referral area. Age 18-95. Bars show average rates; annual rates are shown by a symbol. The numbers to the right of the figure show the number of patients and relevant population, respectively. Average per year in the period 2017-2019.

In general, two different types of dialysis are used in the treatment of patients with kidney disease: hemodialysis and peritoneal dialysis. Hemodialysis removes waste products from the blood using an artificial kidney machine. Patients receiving hemodialysis, either at a dialysis centre or a satellite, usually attend for sessions three times a week, and each session takes 4-5 hours (Norsk

nyreregister 2020).

Hemodialysis at home is also recommended for some patients, if arrangements can be made. Peritoneal dialysis exploits the membrane properties of the peritoneum to remove waste products from the body by injecting dialysis fluid into the abdominal cavity and exchanging it several times a day through a catheter. Peritoneal dialysis is done in the patient's home and can be performed manually or by use of a machine that automatically exchanges the dialysis fluid at night (Norsk nyreregister 2020).

Transplantation, which involves operating a new kidney from a donor into the patient, is a better therapy than dialysis, both in terms of quality of life and survival. A transplant operation requires that the patient is medically fit. A successful kidney transplant is no guarantee that the kidney function will not fail again. In Norway, the goal is to offer transplantation to all medically fit patients, provided the patient is amenable to the procedure.

Results

In cooperation with the Norwegian Renal Registry, the indicators *proportion of kidney transplant patients with blood pressure below 130/80 mmHg; proportion of patients with weekly Kt/V above the set limit;* and *proportion of patients receiving home dialysis* have been selected to quantify the quality of renal replacement therapy.

The Norwegian Renal Registry has provided data for this chapter. The registry had 100 % support from relevant hospitals in the period 2017-2019, and the coverage was 100 % for kidney transplant patients and approximately 100 % for dialysis patients.

Proportion of kidney transplant patients with blood pressure below 130/80 mmHg

An elevated blood pressure gives increased risk of failure of a transplanted kidney. This indicator monitors whether the blood pressure is controlled in accordance with medical guidelines, which recommend that the blood pressure of kidney transplant patients is below 130/80 mmHg. The high target level for this indicator has been set by the Registry Advisory Board at a blood pressure below 130/80 mmHG for minimum 80 % of kidney transplant patients. A moderate and low target attainment level for this indicator is set at 70-80 % and below 70 %, respectively.

Figure 3.42 shows that target attainment was low for the quality indicator *proportion of kidney transplant patients with blood pressure below 130/80 mmHg* in the period 2017-2019. Only one of the referral areas, østfold, achieved a moderate target level for one of the years. Most of the other referral areas were far from achieving a moderate target level. Some referral areas had a significantly greater proportion of patients with blood pressure below 130/80 mmHg than other areas. The østfold referral area had almost twice as high a proportion of patients with blood pressure below the recommended limit as Helgeland, which had an average target attainment of roughly 33 % in the period. Regionally, Health North RHA and Health Central RHA had the lowest proportion of patients with blood pressure below 130/80 mmHg, with a proportion of 40 %, and Health West RHA was highest with a proportion of 47 %. Nationally, an average of 43 % of the patients had a blood pressure below 130/80 mmHg in the period 2017-2019. At a national level, the annual variation did not show a trend towards higher target attainment.

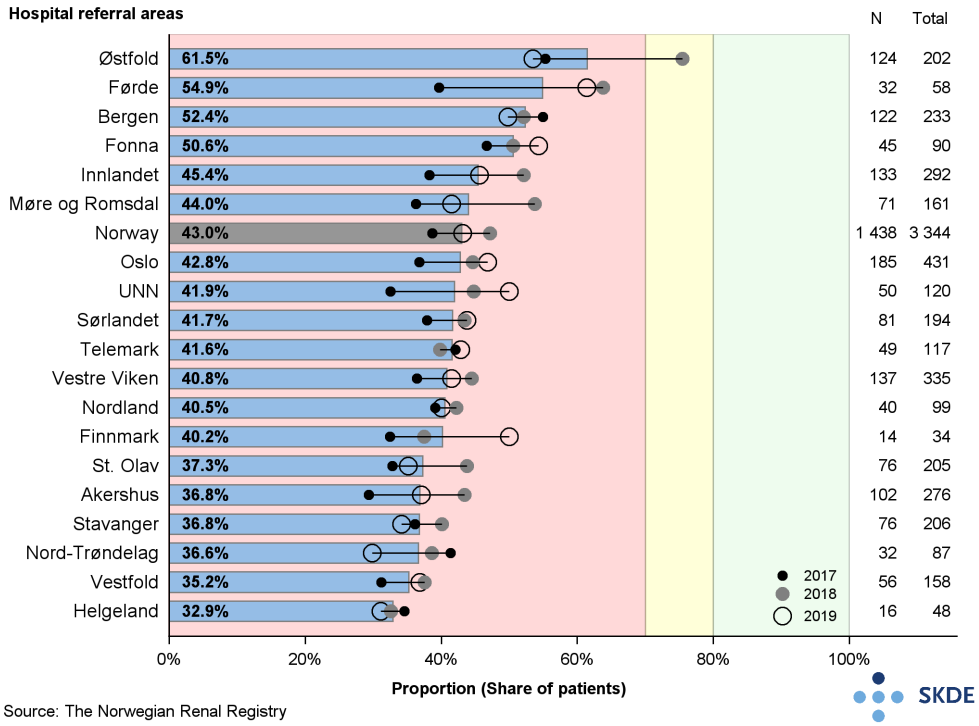

Figure 3.42: Kidney disease. Proportion of kidney transplant patients with blood pressure below 130/80 mmHg, broken down by referral area. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients with blood pressure below 130/80 mmHg (N) and the number of kidney transplant patients (total relevant cases). Average per year in the period 2017-2019.

Proportion of patients with weekly Kt/V above the set limit

The indicator *proportion of patients with weekly Kt/V above the set limit* measures the effect of hemodialysis treatment. Efficient dialysis is important for patient survival and for reduction of health problems associated with chronic kidney disease. Kt/V is a variable describing how effectively the dialysis removes waste products from the blood. K is the theoretical rate of blood where carbamide (urea) is fully removed, expressed in millilitres per week, t is the time and V is the body's volume of fluids, calculated on the basis of the patient's weight. Kt/V is therefore an expression of how large a part of the patient's fluid volume is cleansed of carbamide as a waste product over a period of time. This will be the sum of what is cleansed through dialysis and what is secreted in the patient's failing kidneys. According to medical guidelines, the weekly Kt/V should be above 2.3 for hemodialysis (Norsk nyreregister 2020). The Registry Advisory Board has set the high target level at a weekly Kt/V above the set limit for minimum 80 % of the patients. A moderate and low target attainment level is set at 70-80 % and below 70 %, respectively.

As Figure 3.43 shows, 4 of the 19 referral areas achieved high target attainment level for the quality indicator *proportion of patients with weekly Kt/V above the set limit* in the period 2017-2019. Eleven referral areas had a moderate target attainment, whereas the remaining 4 referral areas had low target attainment for this indicator.

There was great variation across referral areas in the proportion of patients with weekly Kt/V above the set limit. The average proportion of patients achieving their treatment goal was 34 % in østfold, compared to 85 % in Førde. Regionally, the proportion of patients with weekly Kt/V

above the set limit was highest in Health North RHA. Of patients living in this region, 79 percent had a weekly Kt/V above the set limit, compared to 67 % of the patients living in Health South-East RHA, with the lowest proportion. Nationally, target attainment was relatively stable at a moderate target level, with an average of approximately 71 %. The annual variation showed no trend towards higher target attainment throughout the period, neither nationally nor for individual referral areas.

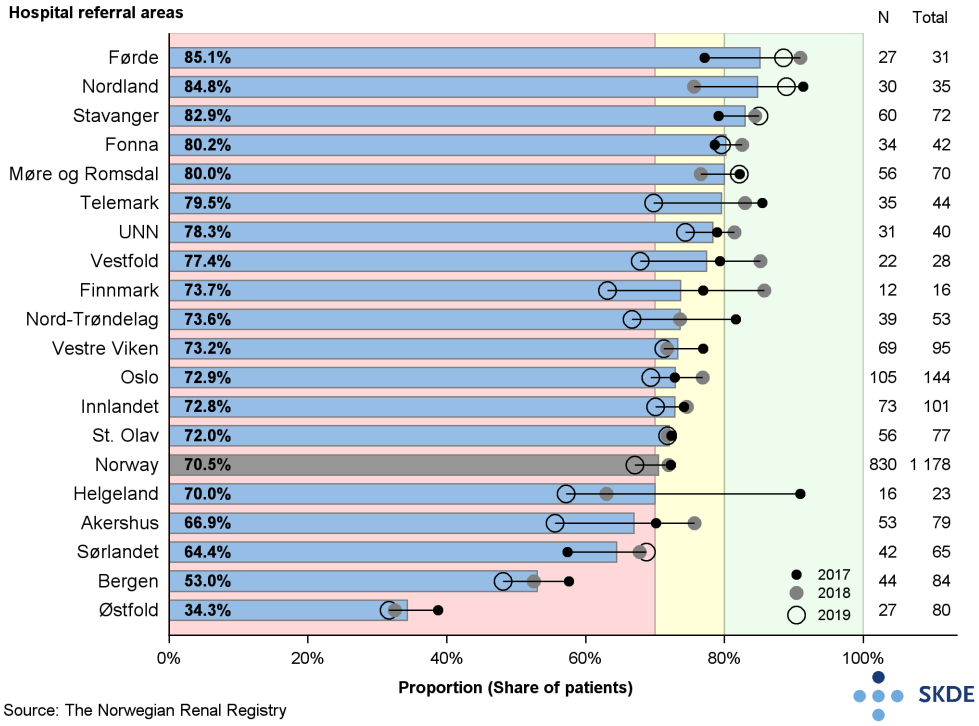

Figure 3.43: Kidney disease. Proportion of patients with weekly Kt/V above the set limit (hemodialysis), broken down by referral area. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients with weekly Kt/V above the set limit (N) and the number of patients undergoing hemodialysis (total relevant cases). Average per year in the period 2017-2019.

Proportion of patients with home dialysis

Home dialysis is defined as dialysis therapy that is not performed in a kidney ward or dialysis satellite. Basically, the patient carries out this treatment personally, possibly with the assistance of next-of-kin or home care service providers. Although it is possible to carry out hemodialysis at home, in most cases peritoneal dialysis is used in a home setting. Home dialysis has many advantages, for example that the patient does not have to travel to the dialysis centre, dialysis can be done when it suits the patient (possibly at night), the patient can do the dialysis more frequently and for a longer period of time, which gives improved treatment efficacy, and home dialysis, when done as peritoneal dialysis, is a more cost-effective therapy option than dialysis in a hospital (Helsedirektoratet 2018). The proportion of patients with home dialysis is a national quality indicator, and the target levels for this indicator are defined by the Norwegian National Council for Priority Setting in Healthcare (Helsedirektoratet 2018). This indicator has two target levels (high and low). The high target level is set at minimum 30 %, and low target level is below 30 %.

Figure 3.44 shows that target attainment for the quality indicator *proportion of patients with home dialysis* was low in the period 2017-2019, and that some referral areas had a significantly higher proportion of patients with home dialysis than others. The Akershus and Oslo referral areas had the highest proportion of patients with home dialysis, with 36 % and 29 %, respectively, of the patients living in these referral areas receiving this therapy. Akershus was the only referral area that achieved high target attainment throughout the period, while Helgeland and Oslo achieved high target attainment in 2018 and 2019, respectively. The proportion of patients with home dialysis was lowest for patients living in the Bergen and Møre og Romsdal referral areas, with an average of 11-12 %. Regionally, target attainment was low. Both Health North RHA and Health South-East RHA reported an average proportion of 25 % of patients with home dialysis, whereas Health West RHA and Health Central RHA had approximately 16 % of their patients in home dialysis. Health North RHA showed a reduction in the number of patients with home dialysis in the period, from 27 % in 2017 to 21 % in 2019. Health West RHA and Health Central RHA reported an increase in the proportion of patients with home dialysis towards the end of the period: 18 % of the patients living in these regions received home dialysis in 2019. Nationally, target attainment was low, and the proportion of patients with home dialysis was stable at roughly 22 %.

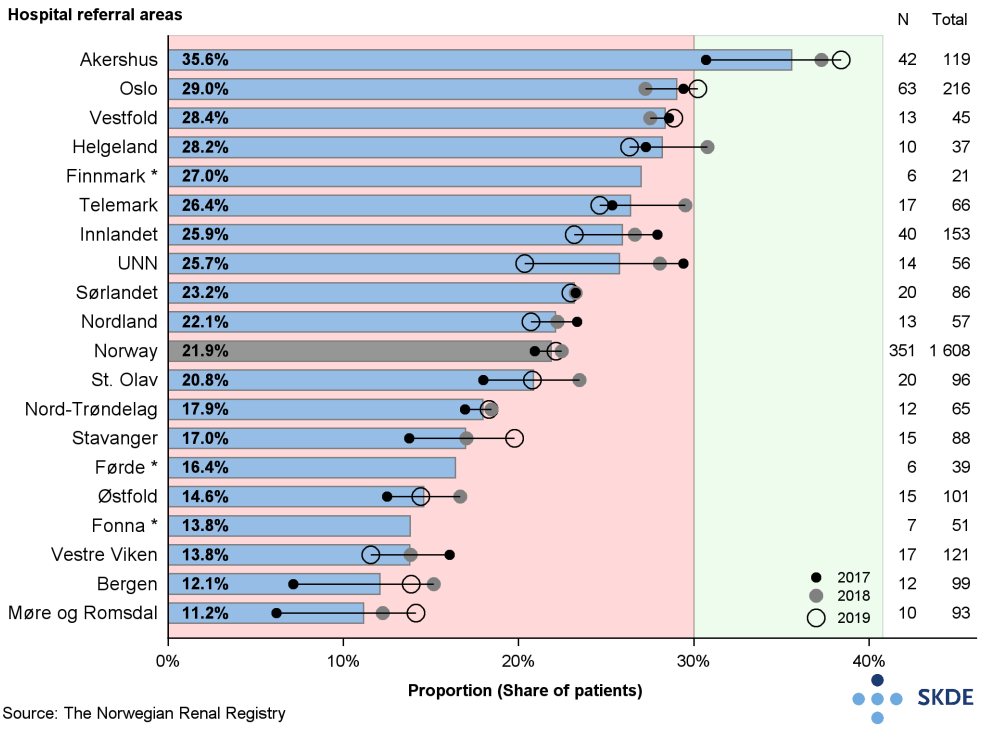

Figure 3.44: Kidney disease. Proportion of patients with home dialysis, broken down by referral area. Bars show average proportions; annual proportions are shown by a symbol. The numbers to the right of the figure show the number of patients with home dialysis (N) and the number of patients in need of dialysis (total relevant cases). Average per year in the period 2017-2019. * Referral area has less than 10 cases on average per year.

Because the number of patients (N) for this quality indicator was small, there may be considerable random variation in the results for several referral areas. When N is low, individual patients' desires, needs and possibilities with regard to treatment can produce major variations from year to year. For the referral areas where N was lowest, specifically Finnmark, Førde and Fonna, annual variation is believed to be unreliable and is therefore not shown.

Discussion of results

The results show that the referral areas had a varying degree of target attainment for the various quality indicators for renal replacement therapy. For example, the østfold and Bergen referral areas had the highest proportion of kidney transplant patients with blood pressure below 130/80 mmHg in the period, but these referral areas were also among those reporting the lowest proportion of hemodialysis patients with satisfactory dialysis efficacy and the lowest proportion of home dialysis patients.

Good blood pressure management is important for the lifespan of both the patient and the transplanted kidney, and preliminary results of an analysis of survival in persons in the Norwegian Renal Registry indicate that having a systolic blood pressure higher than 130 mmHg one year after kidney transplant, is a risk factor for mortality (Norsk nyreregister 2020). No referral areas achieved a high or moderate target level for the quality indicator *proportion of patients with blood pressure below 130/80 mmHg*, assessed based on the average result for the period, and therefore it is pertinent to ask whether this indicator is set too high, or whether efforts in this area are inadequate.

Not all patients will be able to achieve the target of blood pressure below 130/80 mmHg, in spite of aggressive anti-hypertensive therapy. The reason why the target is not achieved, could be, for example, side effects from use of anti-hypertensive drugs. At the same time, results from the Norwegian Renal Registry indicate that a large proportion of kidney transplant patients were not followed up according to the post-transplant recommendations. When in a stable phase following kidney transplantation, the patients should have a check-up every three months, among other things to ensure that blood pressure is adequately managed, but this was done for only approximately 70 % of the patients in the period 2017-2019 (Norsk nyreregister 2020). According to the Norwegian Renal Registry, there was a significant correlation between 3-monthly check-ups and blood pressure control, and such check-ups therefore need to be given high priority. It can be argued that good quality of treatment has not been achieved if patients with a higher-than-recommended blood pressure are not followed up in accordance with the guidelines.

For patients undergoing dialysis, the results show great variation in target attainment for the quality indicator *proportion of patients with weekly Kt/V above the set limit*. There could be many and complex reasons why waste products are not being adequately removed from the blood, for example that the patient does not adhere to dietary recommendations, that the disadvantages to the patient from more intensive dialysis outweigh the advantages, or that getting to the dialysis centre requires a long or arduous journey. Patient lifestyle affects the accumulation of waste products in the blood, and therefore the fact that the patient does not follow dietary recommendations may affect the result.

The target is that minimum 30 % of the patients should receive home dialysis, but for the period 2017-2018 the proportion of home dialysis patients was stable at approximately 22 % nationally. However, this indicator does not allow for the group of patients who have tried home dialysis (peritoneal dialysis), but where this therapy has malfunctioned. Some patients are not comfortable with home dialysis, while others suffer infections that affect the filtering properties of the peritoneum, which renders peritoneal dialysis impossible. In addition, the offer of a kidney transplant could be one reason why the proportion of home dialysis patients varies over time. Moreover, the patient's own wishes may be important as not all patients wish to self-treat at home.

Chapter 4

Overall summary of quality in selected essential health services

This chapter presents a selection of quality indicators from all specialist areas reported in this Healthcare Quality Atlas, to give an overall summary of the quality of the selected essential healthcare services. The Healthcare Quality Atlas is based on data for almost 100,000 patients and their treatments each year, some of whom may have received the same treatments several times, or have multiple diseases. The aim is to examine whether the population receives equitable quality of care in the essential health services, regardless of where they live, and to highlight whether the duty of care to provide essential health services for patients who suffer severe illness is properly looked after.

Many aspects of quality in the essential health services are illuminated in this Healthcare Atlas, but they nevertheless fail to provide a complete picture of the quality and fulfilment of the duty of care to provide essential health services. This Healthcare Atlas is affected by the specialist areas that actually maintain quality registries, the data quality in the registries, the quality indicators available, and the quality indicators actually selected here. Presentation of the selected quality indicators collectively entails the presentation of a great deal of data. Such a compilation requires further selection and simplification of a complex reality.

Of the 31 selected indicators, 24 have been given predefined target levels, which can therefore be included in the overall summary given in this chapter. Target attainment given in the figures is an expression of the average attainment in the period 2017-2019, which means that it may have improved during the three-year period, but this is not visible in the average results. Moreover, the figures do not show how far the result lies from the intended target level. For example, a referral area with low target attainment, may have a result that is very close to moderate attainment. The figures present each indicator in the same way. No regard is paid to the severity or importance of the given indicator, or of the size of the patient category. When, despite these simplifications, we examine the results collectively, the reason is to highlight what specialist areas in what referral areas face extraordinary challenges and improvement potential, and to compose a comprehensive picture of the status of quality within the selected quality indicators for each referral area. We believe these perspectives are important and valuable as a starting point for further quality work in the specialist health service, to ensure equitable and sound health services of good quality, regardless of where the patient lives.

To save space the names of the indicators are abbreviated. A summary of the full name and abbreviated name, and the chapters referring to them, is provided in the Appendix B.2.

Results

Nationally[7] the target attainment was either high or moderate for the majority of the 24 indicators chosen to measure quality in the chosen essential health services in the period 2017-2019. Based on the results for the quality indicators chosen, it therefore looks as if patients who were treated for the most serious diseases discussed in this atlas, generally received healthcare services of good quality during the period.

Nationally, target attainment was high for 9 of 24 quality indicators (37 %) and moderate for 42 % of them. For 21 % of the quality indicators, target attainment was low, however,

Even if the national results overall were good, at the same time the attainment levels were variable, and that included geographical variation in quality for a number of the indicators. Moreover, there were quality indicators where many referral areas showed low attainment. Such results suggest that quality improvements occurred in parts of the essential health services in the period 2017-2019, and that there is room for improvement in quality in those services.

Where are the greatest challenges in the referral areas?

In order to illustrate where the quality challenges are greatest in the various referral areas, we have chosen to focus on indicators where target attainment was low. Figure 4.1 shows the high, moderate and low attainment for the 24 quality indicators with a predefined target level, broken down by referral area. Most of the quality indicators have three target levels (high, moderate and low), but a few have just two (high and low) (indicators 1, 6, 7, 11, 15, 22, 23). The quality indicators that were reasonably similar for all referral areas, in other words where the level of geographical variation in the period 2017-2019 was small, are shown on each side of the figure. Where the result varied a great deal between referral areas, in other words where the level of geographical variation was great, are gathered in the centre of the figure. The referral areas are sorted according to the number of indicators with low attainment, and thereafter ranked alphabetically.

There was geographical variation in target attainment for many of the quality indicators in the period 2017-2019, meaning that patients who were resident in those referral areas received better quality in selected essential health services than patients resident in other referral areas. The variation in target attainment between different referral areas also shows at the same time that it was possible to achieve high quality in the treatment reflected in the indicator, but that success varied in different degrees in the various referral areas.

The geographical variation is considered large if target attainment in the referral areas varies from high to low. Examples of quality indicators where the variation in attainment is large between referral areas in the period 2017-2019 is the *management of long-term blood glucose* in both children and adults with diabetes (quality indicators 5, 12 and 20), *treatment of patients with carotid stenosis within 14 days* (10), *estimated proportion of local relapse in patients with rectal cancer* (11), *median survival for lung cancer* (19), and *quality of dialysis treatment for patients with severe kidney disease* (14).

In addition to the quality indicators where target attainment varied significantly between referral areas, there were also some indicators where one particular referral area stood out with a different

[7] Nationally and for the Regional Health Authorities, target attainment is calculated in the same way as for the referral areas, namely as the number of patients nationally or regionally who received the recommended treatment [N], divided by the number of patients nationally/ regionally who were relevant cases for the treatment [total relevant cases].

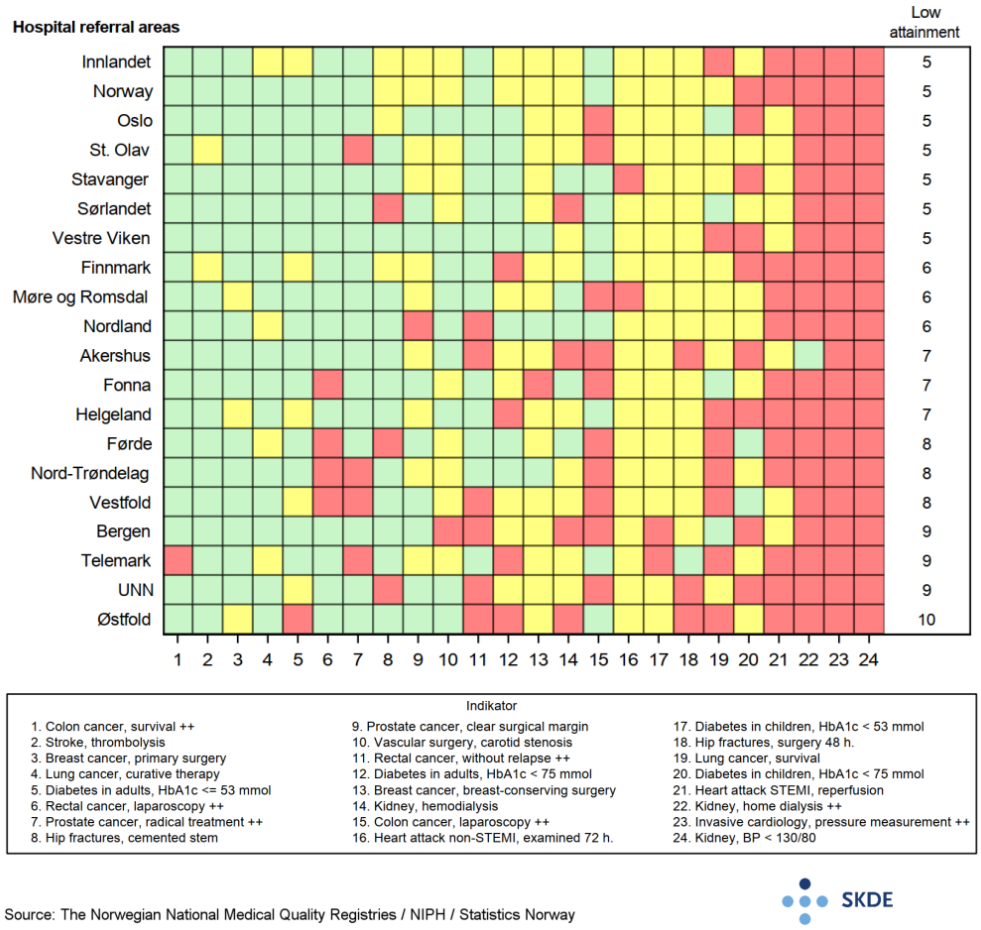

Figure 4.1: Overall summary of quality in selected essential health services for each referral area. High, moderate and low target attainment is coded green, yellow and red. Average result for the period 2017-2019. Indicators marked ++ have only two target values. Numbers to the right show the number of indicators with low attainment.

target attainment than all the other referral areas. That was the case for *100-day survival after operation for colon cancer* (1), where Telemark, as the sole referral area, returned low target attainment. For the quality indicator *proportion of patients in home dialysis* (22), Akershus stood out as the sole referral area with high target attainment.

For referral areas østfold, UNN, Telemark and Bergen, the challenges were the greatest due to low target attainment for many quality indicators. Referral area østfold returned low target attainment for 10 out of 24 quality indicators, whilst UNN, Telemark and Bergen returned 9 indicators with low target attainment.

Figure 4.2 shows the quality of selected essential health services for persons resident in the respective referral areas and regions. The quality indicators where the results were consistently high or low are placed each side of the figure.

At the regional level, the target attainment was varied, and therefore also the geographical variation in quality, for 38 % of the 24 indicators chosen to measure quality of selected essential health services. The result means that all regions returned the same target attainment for 62 % of these quality indicators.

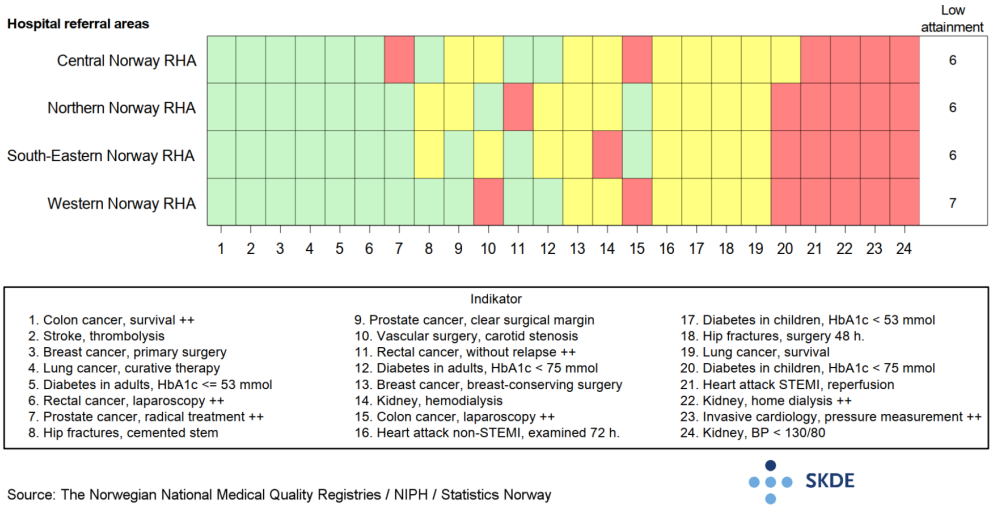

Figure 4.2: Overall summary of quality in essential health services for selected quality indicators for each referral area. High, moderate and low target attainment is coded green, yellow and red. Average result for the period 2017-2019. Indicators marked ++ have only two target values. Numbers to the right show the number of indicators with low attainment.

For the quality indicators chosen to measure the quality of the selected essential health services in the period 2017-2019, Health West RHA returned the most indicators with high target attainment. In this region, attainment was high for 46 % of the indicators showing the quality of selected essential health services, compared with 38 % in Health Central RHA and Health North RHA, which were the regions with the fewest indicators reporting high attainment in the same period. At the same time, Health West RHA was the region with most quality indicators reporting low target attainment, since 29 % of indicators chosen to measure quality in the selected essential health services reported low target attainment in this region, compared with 25 % of the indicators in the other regions.

Quality in the treatment of severe kidney disease stood out because there were no regions that reported high target attainment for any of the 3 indicators chosen to measure the quality of treatment in this specialist field. It is also worth noting that there was low target attainment in all regions for the quality indicator *reperfusion therapy within recommended time in case of STEMI*, which measures the quality of treatment of serious myocardial infarction, and the *proportion of procedures where pressure measurement was performed to judge the degree of narrowing of the coronary arteries*.

As Figure 4.2 shows, there was variation in target attainment among the regions for several of the quality indicators, including the *use of cemented stem prosthesis as treatment for dislocated femoral neck fracture in patients older than 70 years of age (Quality Indicator 8),* and *proportion of clear surgical margin after operation of cancer tumours located in the prostate gland (9),* and *proportion of patients with symptomatic carotid stenosis treated within 14 days (10).*

In the case of two quality indicators, *proportion high-risk patients receiving radical treatment for prostate cancer (7),* and *estimated proportion of patients without local relapse 5 years after operation for rectal cancer (11)*, the target attainment was high in all regions but one, which stood out as having low attainment.

Overall assessment of quality in referral areas

Figure 4.3 is a *Quality Barometer*. The total length of each column represents the sum of target attainments for all the 24 selected quality indicators, where high attainment is represented by a whole box, moderate attainment is represented by 2/3 box, and low attainment is represented by 1/3 box.

The barometer takes into account the status of all target levels and has been developed by the Centre for Clinical Documentation and Evaluation (SKDE) in an attempt to illuminate how well the duty of care to provide essential health services has been fulfilled in each referral area. The figure is affected by the choices we have made in weighting the horizontal column lengths, and does not take account of the type of indicator, the severity of the illness, the size of the patient category, or other relevant metrics.

Another system of weighting or a different approach might have produced different results. Despite the fact that the figure does not offer a complete picture of quality in the essential health services in the referral areas, it does provide useful information on the status of the chosen quality indicators seen as a whole. In that sense the figure can provide a starting point for further quality work to ensure a health service that is both equitable and high quality, regardless of where the patient lives.

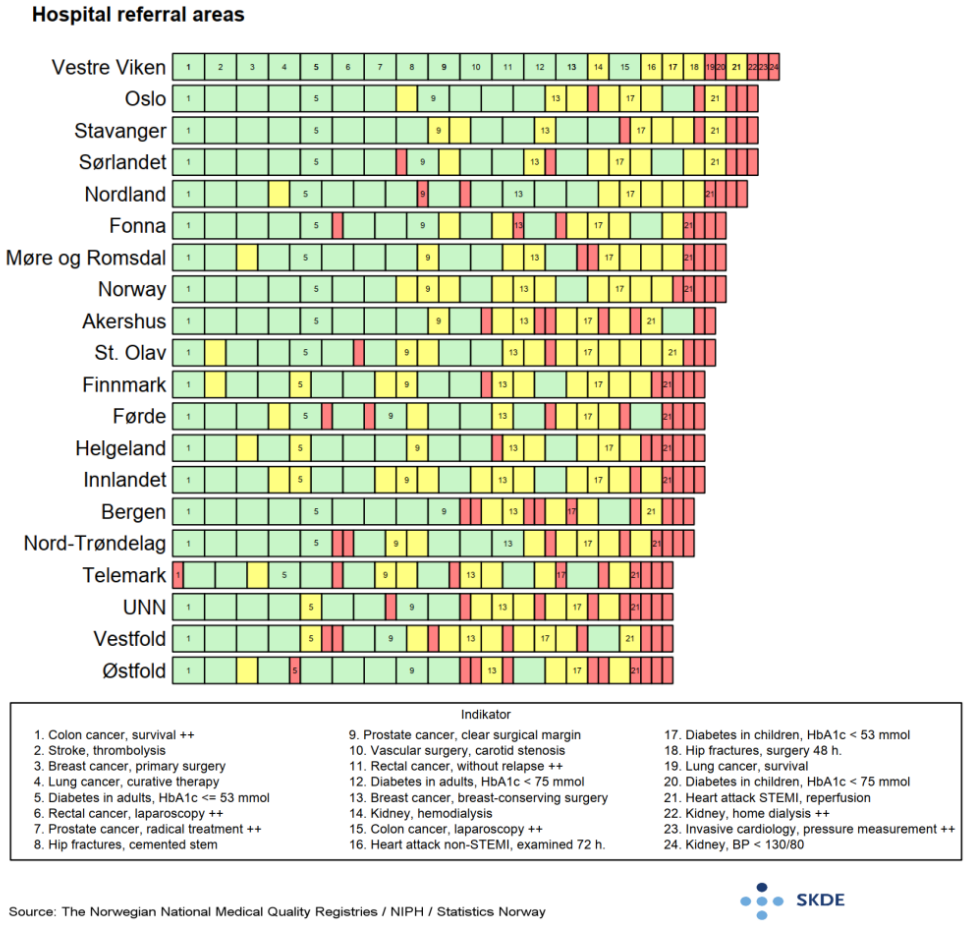

Figure 4.3: Overall summary of quality in selected essential health services for each referral area. High, moderate and low target attainment is coded green, yellow and red. The length of each horizontal column reflects the target attainment, with longer bars reflecting higher attainment. Average result for the period 2017-2019. Indicators marked ++ have only two target values.

Vestre Viken stood out as the referral area with the most quality indicators reaching high target attainment, and was simultaneously among the referral areas with the fewest indicators showing low attainment. Vestre Viken reported high and low target attainment for 58 % and 21 % of the quality indicators, respectively. As Figure 4.3 shows, Vestre Viken was therefore the referral area that overall had the highest target attainment for the quality indicators chosen here to measure the quality of the selected essential health services in this Healthcare Atlas, followed by referral areas Oslo, Stavanger and Sørlandet.

By comparison, referral areas Telemark and UNN had high and low target attainment with 33 % and 38 % of quality indicators, respectively, whilst Vestfold reported 29 % and 33 % respectively. østfold achieved high target attainment for 38 % of indicators, but low target attainment for 42 %. These 4 referral areas had the lowest overall target attainment for the quality indicators chosen to measure quality in the selected essential health services.

Figure 4.4 shows the quality of selected essential health services for persons resident in the referral areas that belong under Norway's four Regional Health Authorities, according to the same principles as Figure 4.3, where horizontal column length reflects attainment level.

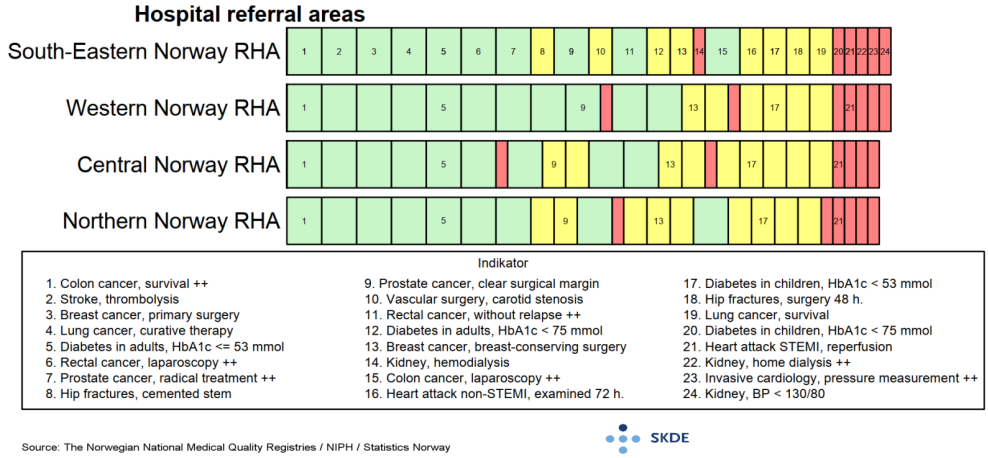

Figure 4.4: Overall summary of quality in selected essential health services for each referral area. High, moderate and low target attainment is coded green, yellow and red. The length of each horizontal column reflects the target attainment, with longer bars reflecting higher attainment. Average result for the period 2017-2019. Indicators marked ++ have only two target values.

Since the referral areas in the Health West RHA region have most indicators with low target attainment, but also the most indicators with high target attainment, this particular presentation does not offer as clear-cut results for residents in Health West RHA as it does for residents in the Health South-East RHA referral areas. For residents in Health North RHA and Health Central RHA, quality is considered overall to be slightly less. Even so, across the regions, the variation in quality for the selected essential health services is overall very small.

Summary

At a regional level, the results show that there was little variation in target attainment for more than half the 24 quality indicators with predefined target levels which were chosen to measure the quality in the essential health services in the period 2017-2019. Among each region's referral areas, the variation in target attainment was larger, as expected, but there were still some quality indicators that showed little geographical variation. When many referral areas returned high attainment for the same indicators, it shows that the quality of treatment shown by the quality

indicator is good overall. Low attainment for the same quality indicators in many referral areas therefore means that the quality does not live up to the professional standards set, and the reasons for this can be multiple and complex. For some indicators, the quality targets set may be ambitious, so that achieving moderate or high attainment is hard. Another possible reason is that the indicators are new and not well-established, so that reports of relevant data that underpin the indicator are not entirely correct. Quality work takes time, and failure to prioritise a particular discipline in the health service may therefore also be a reason why quality targets are not achieved. When all referral areas show low target attainment for a given indicator, it may suggest that the challenges that underpin the result may be of more general or more systematic nature. For the quality indicators in question, further studies should be made to determine the causes of the low target attainment.

For several of the quality indicators, there was variation in target attainment, especially between referral areas within a given region, but also for some indicators between the regions. This means that patients who were resident in a given referral area received better quality from the essential health services than patients resident in other referral areas. It means that good quality can be achieved. There may be many reasons for the variation, including different specialist practices, different preferences for use of technological aids in treatment, or different priorities of quality work in the different referral areas. The causes of the geographical variations in quality in the selected essential health services need to be investigated further, because variation of this kind may suggest that the health service provided to the population are not equitable, and that the duty of care to provide essential health services is not sufficiently fulfilled for all patients with a serious condition who have a need for the essential health services.

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Appendices

Appendix A

Data quality in Norwegian Diabetes Registry for Adults

Here we provide an account of the challenges regarding data quality in the Norwegian Diabetes Registry for Adults in the period 2017-2019.

In 2019, there was complete support from hospitals in three of the regional health areas: Health North RHA, Health West RHA and Health Central RHA. In the fourth, Health South-East RHA, all hospitals reported their results to the Registry with the exception of Lovisenberg Diakonale sykehus. The overall coverage ratio for 2019 was close to 75 %. The following outpatient clinics filed few reports in the year: Sykehuset Innlandet Tynset, Kongsberg sykehus, Ringerike sykehus, Kristiansund Sykehus, Orkdal sykehus, Sykehusene i Telemark (Kragerø, Nortodden and Skien).

In 2018, there was full support from the hospitals in Health North RHA, Health West RHA and Health Central RHA. The overall coverage ratio was more than 70 %. In Health South-East RHA all hospitals reported except Ringerike sykehus, Lovisenberg Diakonale sykehus, Sørlandet sykehus Flekkefjord, and Sykehusene i Telemark (Kragerø, Notodden and Skien).

There was full support from the hospitals in Health North RHA and Health West RHA in 2017. In Health South-East RHA reports were filed from all hospitals except Kongsberg sykehus, Ringerike sykehus and Sykehusene i Telemark (Kragerø, Notodden and Skien). Health Central RHA started filing reports with the Registry in 2017. The overall coverage ratio for the Registry was close to 60 %.

Appendix B

Figures and tables

Table B.1: Hospital referral areas and short names used in the text and figures

Hospital referral area for	Short name
Northern Norway Regional Health Authority	
Finnmark Hospital Trust	Finnmark
University Hospital of Northern Norway Trust	UNN
Nordland Hospital Trust	Nordland
Helgeland Hospital Trust	Helgeland
Central Norway Regional Health Authority	
Helse Nord-Trøndelag health trust	Nord-Trøndelag
St. Olavs Hospital Trust	St. Olav
Helse Møre og Romsdal health trust	Møre og Romsdal
Western Norway Regional Health Authority	
Helse Førde health trust	Førde
Helse Bergen health trust	Bergen
Helse Fonna health trust	Fonna
Helse Stavanger health trust	Stavanger
South-Eastern Norway Regional Health Authority	
Østfold Hospital Trust	Østfold
Akershus University Hospital Trust	Akershus
Oslo University Hospital Trust	OUS*
Lovisenberg Diaconal Hospital	Lovisenberg*
Diakonhjemmet Hospital	Diakonhjemmet*
Innlandet Hospital Trust	Innlandet
Vestre Viken Hospital Trust	Vestre Viken
Vestfold Hospital Trust	Vestfold
Telemark Hospital Trust	Telemark
Sørlandet Hospital Trust	Sørlandet

* Constitutes the referral area of Oslo when information about the city district is missing.

Table B.2: Indicator names in heatmaps

Abbreviated name	Description	Chapter
1. Colon cancer, survival ++	Patients alive 100 days after operation	ch. 3.2.1, p.47
2. Stroke, thrombolysis	Patients with stroke who were treated by thrombolysis	ch. 3.1.3, p.32
3. Breast cancer, primary surgery	Patients who only received one surgical intervention on the primary tumour	ch. 3.2.2, p.52
4. Lung cancer, curative therapy	Lung cancer patients treated with curative therapy	ch. 3.2.3, p.58
5. Diabetes in adults, HbA1c $\leq$ 53mmol	Type 1 diabetes in adults, patients with long-term blood glucose level (HbA1c) under or equal 53 mmol/mol	ch. 3.3.2, p.74
6. Rectal cancer, laparoscopy ++	Pasients with rectal cancer operated by laparoscopy	ch. 3.2.1, p.43
7. Prostate cancer, radical treatment ++	High-risk patients receiving radical treatment	ch. 3.2.4, p.63
8. Hip fractures, cemented stem	Patients older than 70 years of age with a dislocated femoral neck fracture being operated with a cemented stem prosthesis	ch. 3.4.1, p.80
9. Prostate cancer, clear surgical margin	Patients with clear surgical margin after operation for cancer tumours located in prostate (pT2)	ch. 3.2.4, p.64
10. Vascular surgery, carotid stenosis	Patients with carotid stenosis treated within 14 days	ch. 3.1.2, p.28
11. Rectal cancer, without relapse ++	Pasients with rectal cancer without local relapse 5 years after operation	ch. 3.2.1, p.45
12. Diabetes in adults, HbA1c < 75mmol	Type 1 diabetes in adults, patients with long-term blood glucose level (HbA1c) below 75 mmol/mol	ch. 3.3.2, p.74
13. Breast cancer, breast-conserving surgery	Breast-conserving surgery for tumour of diameter less than 30 mm	ch. 3.2.2, p.53
14. Kidney, hemodialysis	Patients with satisfactory dialysis efficacy (hemodialysis)	ch. 3.4.2, p.88
15. Colon cancer, laparoscopy ++	Patients with colon cancer operated by laparoscopy	ch. 3.2.1, p.43
16. Heart attack non-STEMI, examined 72 h.	Patients with non-STEMI examined using invasive procedures within 72 hours	ch. 3.1.1, p.22
17. Diabetes in children HbA1c < 53mmol	Type 1 diabetes in children and youth, patients with long-term blood glucose level (HbA1c) below 53 mmol/mol	ch. 3.3.1, p.69
18. Hip fractures, surgery 48 h.	Patients age 60 years and older operated within 48 hours after time of fracture	ch. 3.4.1, p.81
19. Lung cancer, survival	Median survival (in months)	ch. 3.2.3, p.59
20. Diabetes in children HbA1c < 75mmol	Type 1 diabetes in children and youth, patients with long-term blood glucose level (HbA1c) below 75 mmol/mol	ch. 3.3.1, p.69
21. Heart attack STEMI, reperfusion	Reperfusion therapy within recommended time in case of STEMI	ch. 3.1.1, p.20
22. Kidney, home dialysis ++	Patients with home dialysis	ch. 3.4.2, p.89
23. Invasive cardiology, pressure measurement ++	Procedures where pressure measurement was performed to judge the degree of occlusion of the coronary arteries	ch. 3.1.4, p.38
24. Kidney, blood pressure < 130/80	Patients with blood pressure below 130/80 mmHg	ch. 3.4.2, p.87

++ This indicator has two target levels – high and low. All the others have three target levels – high, moderate and low.

Table B.3: Overview of specialist sectors, indicators and age range in the samples.

Specialist sector	Indicator	Age
Cardiovascular	Heart attack, reperfusion therapy within recommended time in case of STEMI	18–84 yr
	Heart attack, patients with non-STEMI undergoing invasive procedures within 72 hours	18–84 yr
	Vascular surgery, operations for claudication	18–101 yr
	Vascular surgery, patients with carotid stenosis operated within 14 days	27–93 yr
	Stroke, patients with stroke who were treated by thrombolysis	18–99 yr
	Stroke, stroke patients who are admitted within 4 hours	18–99 yr
	Invasive cardiology, PCI in patients undergoing invasive coronary procedures	29–94 yr
	Invasive cardiology, procedures where pressure measurement was performed to judge the degree of occlusion of the coronary arteries	29–94 yr
Cancer	Colon cancer, patients with colon cancer Stages I-III operated by laparoscopy	20–99 yr
	Rectal cancer, patients with rectal cancer Stages I-III operated by laparoscopy	25–96 yr
	Rectal cancer, estimated proportion of patients with rectal cancer Stages I-III without local relapse 5 years after the operation	20–98 yr
	Colon cancer, 100-days mortality after operation	20–99 yr
	Breast cancer, women who only received one surgical intervention on the primary tumour	19–99 yr
	Breast cancer, breast-conserving surgeries, tumour diameter below 30 mm	19–99 yr
	Lung cancer, patients treated with curative therapy	22–98 yr
	Lung cancer, median survival (in months)	19–98 yr
	Prostate cancer, high-risk patients who received radical therapy	38–79 yr
	Prostate cancer, clear surgical margin after operation for cancer tumours located in prostate (pT2)	37–80 yr
Diabetes	Type 1 diabetes in children and youth, patients with long-term blood glucose level (HbA1c) below 53 mmol/mol	0–17 yr
	Type 1 diabetes in children and youth, patients with long-term blood glucose level (HbA1c) below 75 mmol/mol	0–17 yr
	Type 1 diabetes in children and youth, Use of glucose sensor (continuous glucose meter - CGM)	0–17 yr
	Type 1 diabetes in adults, patients with long-term blood glucose level (HbA1c) below or equal to 53 mmol/mol	18–99 yr
	Type 1 diabetes in adults, patients with long-term blood glucose level (HbA1c) below 75 mmol/mol	18–99 yr
	Type 1 diabetes in adults, screening during annual check-up (seven procedures performed)	18–99 yr
Other	Hip fractures, use of cemented stem prosthesis as treatment of dislocated femoral neck fracture	70 yr or older
	Hip fractures, surgery within 48 hours of fracture	60 yr or older
	Hip fractures, average pre-operative hospitalisation	60 yr or older
	Hip fractures, patients with same or improved walking function four months after operation	60 yr or older
	Kidney disease, kidney transplant patients with blood pressure below 130/80 mmHg	18–99 yr
	Kidney disease, patients with weekly Kt/V above the set limit	18–99 yr
	Kidney disease, patients with home dialysis	18–99 yr

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