2026

Quality Indicators Report for guideline

Chronic Kidney Disease: Assessment and Management

Health Insurance Organisation

September 2026

Introductory note

The United Kingdom (UK) National Institute for Health and Care Excellence (NICE) guideline NG203 "Chronic Kidney Disease: assessment and management" was developed in 2021 and was made available to the Health Insurance Organization (HIO) in Cyprus through a license agreement with NICE, towards the contextualization of the guideline to the Cyprus healthcare system framework. To this end, HIO recruited local medical experts in the field of Chronic Kidney Disease, other relevant healthcare professionals, and patient representatives, and formed a Technical Expert Committee (TEC). The TEC was supported by the Guidelines Scientific Secretariat who managed the guideline process along with HIO and provided support in committee recruitment, methodological issues, stakeholder consultation and guideline publication and dissemination. In a series of meetings and following a public consultation procedure, the TEC members assessed the scope and the full text of the guideline, and implemented modifications, if these were well supported by scientific evidence. In addition, the TEC members examined the quality indicators relating to the diagnosis and management of chronic kidney disease that have been developed by NICE for the UK National Health Service (NHS), in terms of their applicability for the Cyprus General Health System (GESY). Those that were deemed both clinically relevant and technically feasible were selected for implementation. In total, seven indicators were suggested by TEC for implementation in the GESY and are listed below while a full description is available in Appendix I.

Table 1: Quality indicators for the contextualized Chronic Kidney Disease guideline

Indicator name	Indicator description
NM109	The percentage of patients coded for CKD who have a referral history for testing albumin:creatinine ratio (or protein:creatinine ratio) in the urine, the previous 12 months.
NM213	The percentage of CKD coded patients, who are currently treated with a lipid lowering therapy.
NM214	The percentage of patients without a CKD code who have been prescribed long-term (chronic) oral non-steroidal anti-inflammatory drugs (NSAIDs) and who have had an eGFR (estimated Glomerular Filtration Rate) measurement in the previous 12 months.
NM215	The percentage of newly CKD coded patients with stage G3-G5, within the preceding 12 months, who had eGFR measured on at least 2 occasions separated by at least 90 days, and the second test within 90 days before the diagnosis.
NM216	The percentage of newly CKD coded patients with stage G3-G5, within the preceding 12 months, who had eGFR and ACR (urine albumin to creatinine ratio) measurements recorded within 90 days before or after diagnosis
NM247	The percentage of CKD-coded patients and with an albumin to creatinine ratio (ACR) of 500 mg/gr or more, without diabetes, who are currently treated with an ARB or an ACE inhibitor.
NM84	The percentage of CKD-coded patients who have hypertension and proteinuria and who are currently being treated with an angiotensin-receptor blocker or an angiotensin-converting enzyme inhibitor.

Following the selection of the quality indicators, HIO officers, including information technology (IT) personnel, with the support of an external support committee (Secretariat), ran several tests to finalize the indicator business rules (calculation algorithms), indicator data sources, and collected variables (variable codes) from the HIO data system. Where appropriate, both inpatient and outpatient data sources and variable codes were included for several diagnoses, and Appendix II describes the business rules used for the development of the indicators.

At the time of preparing this report, all indicators were incorporated in the HIO IT system, with the exception of indicator NM247. As such, data extraction and analysis were not possible only for this indicator. This report will compare the indicator output for NM109, NM213, NM214, NM215, NM216, and NM84, between the baseline period (01/11/2023 - 31/10/2024) and the reporting period (01/11/2024 - 31/10/2025). The baseline period corresponds to the last year prior to the implementation of the contextualized NICE NG203 “Chronic Kidney Disease: assessment and management” within the framework of GESY. Furthermore, this report aims to put in context the indicators’ output by providing an overview of the relevant scientific literature in the subject and similar indicator output or metrics from other healthcare systems across the world in the form of a short narrative literature review. Finally, this report aims to provide suggestions to the HIO for further improvement of quality of care in the area addressed by the examined indicators.

Methods

Synthesis and statistical comparisons

The outputs of indicators NM109, NM213, NM214, NM215, NM216, and NM84 are presented as percentages and are visualized in the form of bar charts across the two periods. Comparison between the two periods (baseline and reporting period) for each indicator is carried out using the Pearson’s Chi-squared test for categorical variables. Statistical significance is set at $p < 0.05$ and all graphs were generated using Microsoft Excel.

Narrative literature review

The electronic databases PubMed and Google Scholar were searched from January 2000 until October 2025 using appropriate search terms to identify studies or published reports providing information relating to all indicators. Studies were considered relevant if they provided the same indicator metrics

or enough data in the form of numerator/denominator to calculate the corresponding indicator metrics. Examples of combinations of search terms used for the selection of relevant studies for each indicator are provided in Table 2. Boolean operators “AND”, “OR” were used to structure search algorithms.

Table 2: Narrative review literature search terms

Indicator	Search terms
NM109	(“Chronic Kidney Disease” OR “Renal patients” OR “Renal disease”) AND (“albumin to creatinine ratio” OR “albumin:creatinine ratio” OR “albumin:creatinine” OR “protein to creatinine ratio” OR “protein:creatinine ratio” OR “protein:creatinine” OR “urine albumin to creatinine ratio” OR “urine albumin:creatinine ratio” OR “urine albumin:creatinine” OR “urine protein to creatinine ratio” OR “urine protein:creatinine ratio” OR “urine protein:creatinine”) AND (“testing” OR “examination” OR “result”) AND (“registry” OR “population based” OR “national”)
NM213	(“Chronic Kidney Disease” OR “Renal patients” OR “renal disease”) AND (“lipid lowering therapy” OR “lipid lowering drug” OR “lipid lowering medication” OR “statins” OR “fibrates” OR “ezetimibe”) AND (“registry” OR “population based” OR “national”)
NM214	(“non-steroidal anti-inflammatory drugs” OR “NSAIDs” OR “ibuprofen” OR “aspirin”) NOT (“Chronic Kidney Disease” OR “Renal patients” OR “renal disease”) AND (“eGFR” OR “estimated glomerular filtration rate” OR “glomerular filtration rate”) AND (“registry” OR “population based” OR “national”)
NM215	(“Chronic Kidney Disease” OR “Renal patients” OR “renal disease”) AND (“eGFR” OR “estimated glomerular filtration rate” OR “glomerular filtration rate”) AND (“registry” OR “population based” OR “national”)
NM216	(“Chronic Kidney Disease” OR “Renal patients” OR “renal disease”) AND (“eGFR” OR “estimated glomerular filtration rate” OR “glomerular filtration rate”) AND (“ACR” OR “urine albumin to creatinine ratio” OR “urine ACR” OR “albumin to creatinine ratio”) AND (“testing” OR “examination” OR “result”) AND (“registry” OR “population based” OR “national”)
NM84	(“Chronic Kidney Disease” OR “Renal patients” OR “renal disease”) AND (“Hypertension” OR “high blood pressure”) AND (“macroalbuminuria” OR “ACR” OR “urine albumin to creatinine ratio” OR “urine ACR” OR “albumin to creatinine ratio”) AND (“ARB” OR “Angiotensin Receptor Blocker” OR “ACE” OR “Angiotensin Converting Enzyme inhibitor” OR “ACE inhibitor”) AND (“registry” OR “population based” OR “national”)

Results

For each indicator, the output for the baseline and reporting period has been provided by HIO in November 2025 and the Secretariat analyzed the data and reviewed relevant literature in November - December 2025 while the Final Report was submitted to HIO in June 2026. The output for all indicators is provided in Table 3 below and summarized in Figures 1-6.

Overall, four out of the six indicators demonstrated improvement between the baseline and reporting period, while the remaining two indicators were characterized by minor decline. Specifically, indicator NM109 (CKD patients referred for urine albumin:creatinine ratio or protein:creatinine ratio, the previous 12 months) was estimated at 33.7% in the baseline period and after guideline implementation increased to 41.8% (+8.1%, p<0.001). Indicator NM214 (non-CKD coded prescribed long-term (chronic) oral NSAIDs and who have had an eGFR measurement in the previous 12 months) demonstrated the most profound improvement after the implementation of the guideline. In the baseline period, the indicator value was extremely low at 5.6% and increased to 51.1%, corresponding to an absolute increase of 45.5%, which was statistically significant (p<0.001). A notable improvement was also observed in indicator NM216 (newly CKD coded patients with stage G3-G5, within the preceding 12 months, who had eGFR and ACR measurements recorded within 90 days before or after diagnosis). The estimates for this indicator were 15.8% in the baseline period and 37.5% in the reporting period (+21.7%, p<0.001). Lastly, indicator NM215 (newly CKD coded patients, who had eGFR measured on at least 2 occasions separated by at least 90 days, and the second test within 90 days before the diagnosis) was estimated at 10.0% during the baseline period and increased to 24.3% after the guideline implementation and this increase was statistically significant (p<0.001).

On the other hand, estimates for indicators NM213 and NM84 that relate to pharmacological management in CKD were slightly lower after guideline implementation. In more detail, indicator NM213 (CKD coded patients, who are currently treated with a lipid lowering therapy) demonstrated a minor absolute decline of -1.8%, from 58.5% to 56.7%, which was statistically significant (p<0.001). Furthermore, indicator NM84 (CKD-coded patients who have hypertension and proteinuria and who are currently being treated with an angiotensin-receptor blocker or an angiotensin-converting enzyme inhibitor) was estimated at 63.3% in the baseline period and slightly declined to 61.7% after guideline implementation but this difference was not statistically significant (-1.6%, p=0.446).

Table 3: Indicator output for the evaluated indicators

Indicator	Short description	Indicator (baseline period, 01/11/2023 - 31/10/2024)		Indicator (reporting period, 01/11/2024 - 31/10/2025)		Difference
NM109	The percentage of patients coded for CKD who have a referral history for testing albumin:creatinine ratio (or protein:creatinine ratio) in the urine, the previous 12 months.	Numerator: 7,600 Denominator: 22,561	**33.7%**	Numerator: 11,677 Denominator: 27,923	**41.8%**	**+8.1%***
NM213	The percentage of CKD coded patients, who are currently treated with a lipid lowering therapy.	Numerator: 10,164 Denominator: 17,368	**58.5%**	Numerator: 12,267 Denominator: 21,623	**56.7%**	**-1.8%***
NM214	The percentage of patients without a CKD code who have been prescribed long-term (chronic) oral non-steroidal anti-inflammatory drugs (NSAIDs) and who have had an eGFR measurement in the previous 12 months.	Numerator: 70 Denominator: 1253	**5.6%**	Numerator: 628 Denominator: 1230	**51.1%**	**+45.5%***
NM215	The percentage of newly CKD coded patients with stage G3-G5, within the preceding 12 months, who had eGFR measured on at least 2 occasions separated by at least 90 days, and the second test within 90 days before the diagnosis.	Numerator: 256 Denominator: 2564	**10.0%**	Numerator: 743 Denominator: 3059	**24.3%**	**+14.3%***
NM216	The percentage of newly CKD coded patients with stage G3-G5, within the preceding 12 months, who had eGFR and ACR (urine albumin to creatinine ratio) measurements recorded within 90 days before or after diagnosis.	Numerator: 404 Denominator: 2564	**15.8%**	Numerator: 1148 Denominator: 3059	**37.5%**	**+21.7%***
NM84	The percentage of CKD-coded patients who have hypertension and proteinuria and who are currently being treated with an angiotensin-receptor blocker or an angiotensin-converting enzyme inhibitor.	Numerator: 608 Denominator: 960	**63.3%**	Numerator: 752 Denominator: 1218	**61.7%**	**-1.6%**

**Significant at p<0.05 level; CKD: Chronic Kidney Disease, eGFR: estimated Glomerular Filtration Rate, NSAIDs: non-steroidal anti-inflammatory drugs, ACR: albumin to creatinine ratio, ACE: Angiotensin Converting Enzyme*

Figure 1: Indicator NM109 - chronic kidney disease (CKD) patients referred for urine albumin:creatinine ratio (ACR) or protein:creatinine ratio (PCR), the previous 12 months for the baseline and reporting period

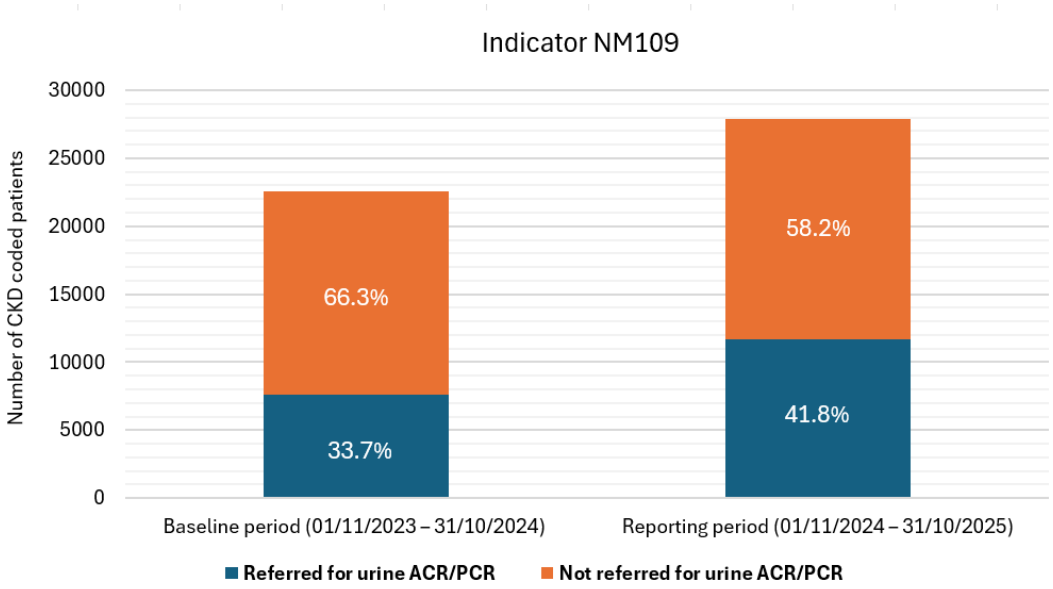


Figure 2: Indicator NM213 - percentage of chronic kidney disease (CKD) coded patients, who are currently treated with a lipid lowering therapy for the baseline and reporting period

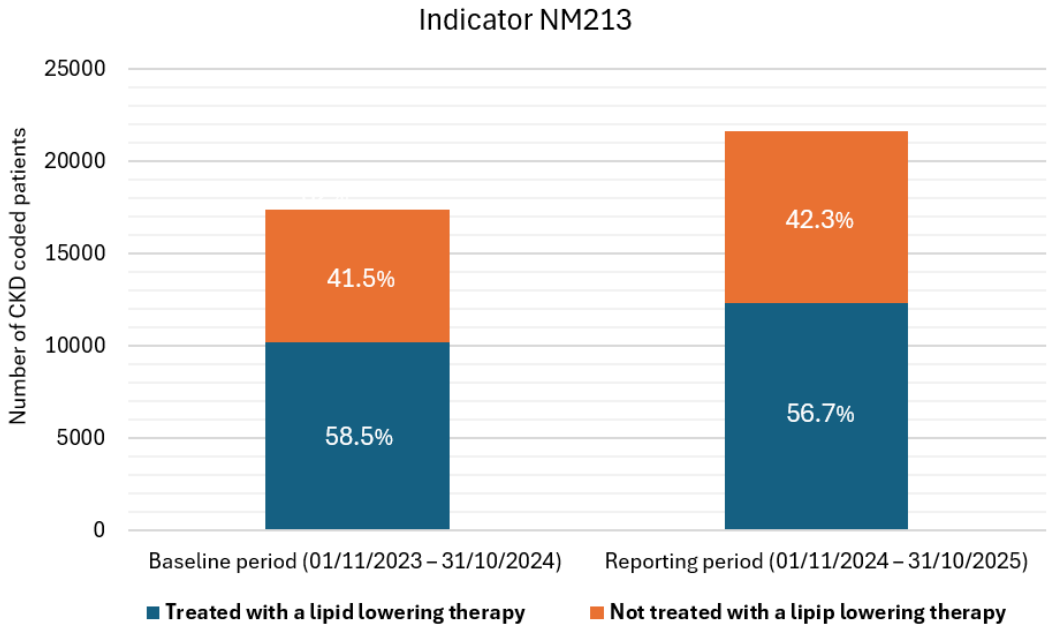


Figure 3: Indicator NM214 - percentage of patients without a chronic kidney disease (CKD) code who have been prescribed long-term (chronic) oral non-steroidal anti-inflammatory drugs (NSAIDs) and who have had an eGFR measurement in the previous 12 months for the baseline and reporting period

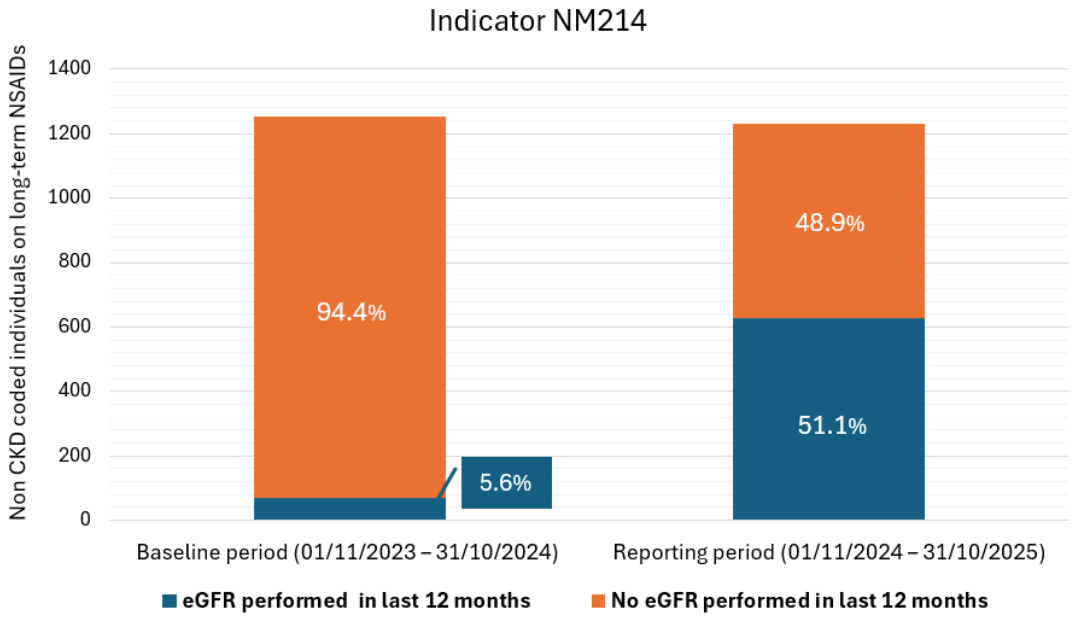


Figure 4: Indicator NM215 - percentage of newly chronic kidney disease (CKD) coded patients with stage G3-G5, within the preceding 12 months, who had eGFR measured on at least 2 occasions separated by at least 90 days, and the second test within 90 days before the diagnosis for the baseline and reporting period

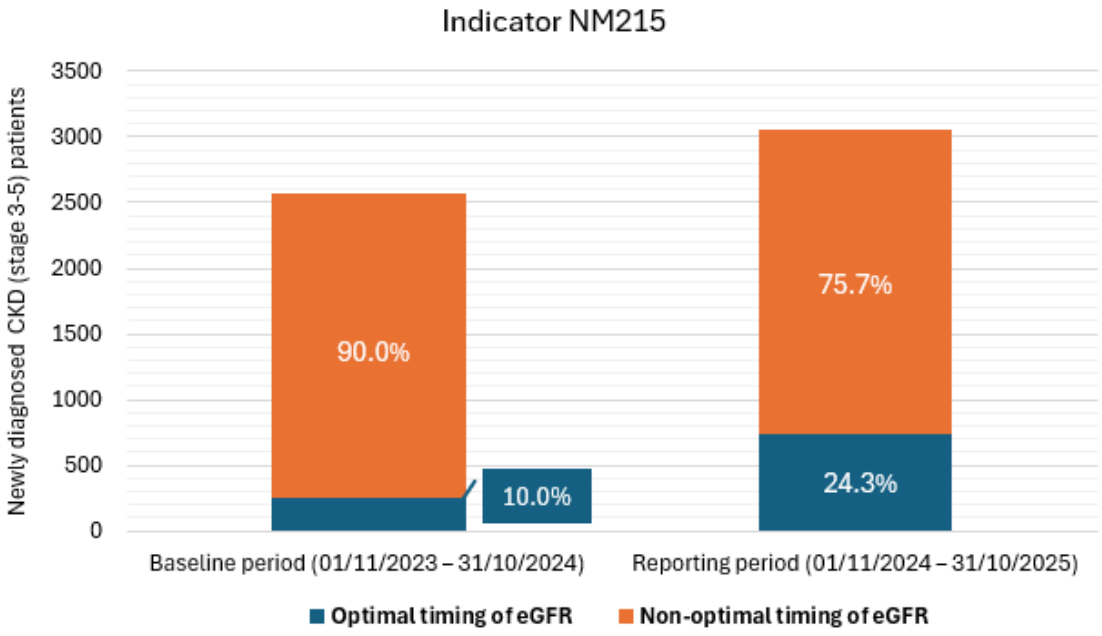


Figure 5: Indicator NM216 - percentage of newly chronic kidney disease (CKD) coded patients with stage G3-G5, within the preceding 12 months, who had eGFR and urine albumin to creatinine ratio (ACR) measurements recorded within 90 days before or after diagnosis for the baseline and reporting period

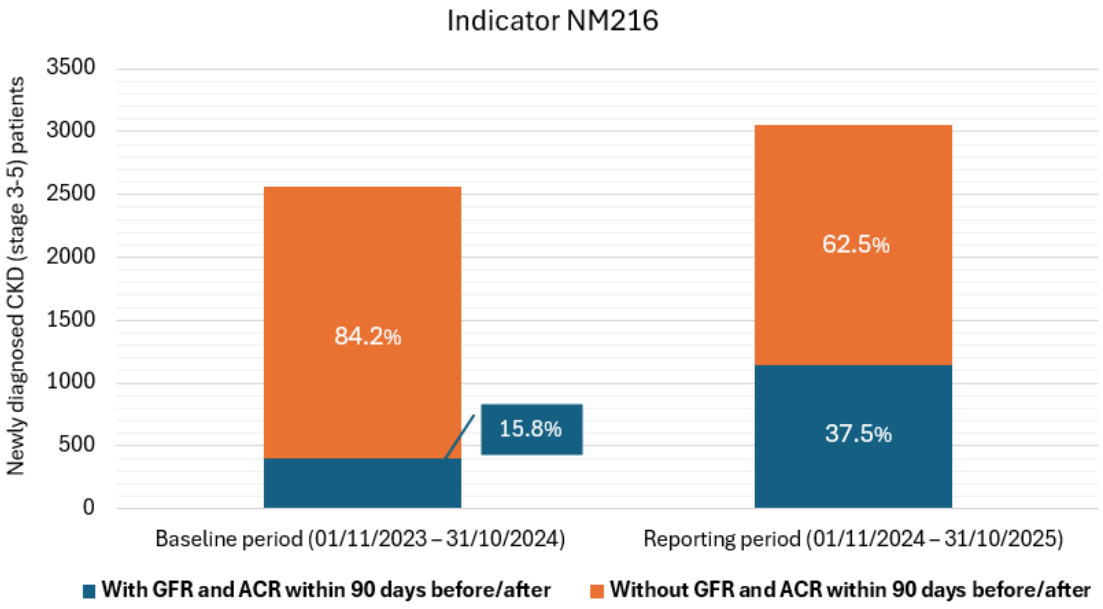
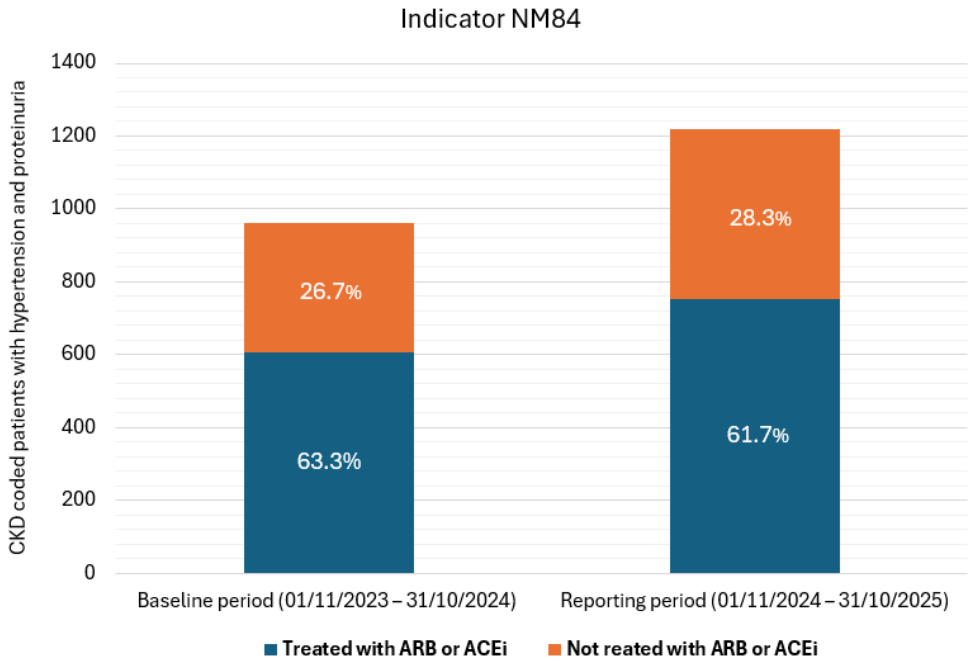


Figure 6: Indicator NM84 - percentage of chronic kidney disease (CKD) coded patients who have hypertension and proteinuria and who are currently being treated with an angiotensin-receptor blocker (ARB) or an angiotensin-converting enzyme inhibitor (ACEi) for the baseline and reporting period



Narrative review

This section presents the narrative synthesis for indicators NM109, NM213, NM214, and NM84. A narrative synthesis for indicator NM247 was not carried out as it has not been calculated in the current reporting period and no comparable evidence was identified for indicators NM215 and NM216 in the published literature. In more detail, although several studies report the frequency of eGFR and ACR testing in CKD populations, none provide the level of temporal specificity required to assess whether repeat eGFR measurements are obtained ≥90 days apart prior to diagnosis, nor whether eGFR and ACR assessments occur within a defined 90-day diagnostic window. This absence of directly comparable data represents a limitation of the review. However, it also reflects the highly technical nature of these indicators: the precise timing of renal function and albuminuria monitoring is rarely captured or reported in research and quality of care studies, reports of administrative datasets, or international registries. Nevertheless, despite not being routinely reported elsewhere, NM215 and NM216 address dimensions of diagnostic quality and should be part of health system performance monitoring and reporting. In Cyprus the corresponding indicator estimates for both NM215 and NM216 have been substantially improved although the absolute values are very low (especially for NM215). Therefore, the relevant recommendations towards enhancing the implementation of the contextualized guideline NG203 “Chronic Kidney Disease: assessment and management”, should take into account the processes evaluated by these two indicators. A detailed narrative synthesis and summary presentation of characteristics studies for indicators NM109, NM213, NM214, and NM84 is available below. For all included studies, data were extracted for the following parameters: Author name, year of publication, time-period under study, country, population involved, CKD patient group, sample size and the measure estimate corresponding to the relevant indicator evaluated.

Synthesis of findings for indicator NM109: *The percentage of patients coded for CKD who have a referral history for testing albumin:creatinine ratio (or protein:creatinine ratio) in the urine, the previous 12 months.*

Management of patients with CKD at any stage includes regular follow-ups and testing for several biomarkers which could indicate the progression of the disease and the effectiveness of the administered therapy. As such, measurement of urinary albumin excretion, preferably via the albumin:creatinine ratio (ACR), or alternatively the protein:creatinine ratio (PCR), is a cornerstone of CKD assessment. ACR testing provides sensitive detection of albuminuria, an early marker of

glomerular injury, and is strongly predictive of cardiovascular mortality, heart failure-related hospitalization and, CKD progression to end-stage renal disease (Carrero & Elinder, 2022). Furthermore, the association between ACR and adverse outcomes is characterized by a well-defined dose-response relationship. For example, as summarized in a review paper targeting general practitioners, compared to low ACR levels, higher categories of ACR levels were associated with a stepwise increase in the risk of CKD progression while the same applied for cardiovascular and all-cause mortality (Fraser et al., 2016). Therefore, the indicator NM109 captures whether healthcare systems are identifying and monitoring a core pathophysiologic marker of kidney damage that can support early intervention and may contribute to long-term renal and cardiovascular outcomes. Overall, the narrative review identified several studies from different countries across the world that reported the frequency of laboratory tests in CKD. Nevertheless, to facilitate comparability with the Cyprus indicators results, the review focused on studies that relied on administrative datasets and on the analysis of electronic health record data.

Table 4: Studies reporting the percentage with CKD who were tested for urine albumin:creatinine ratio

#	Author (year)	Country	Chronic Kidney Disease (CKD) patient group	Population	Time period	Sample Size	Proportion of CKD patients tested for albumin:creatinine ratio (ACR)
1	(Carrero & Elinder, 2022)	Sweden	Any stage of CKD	Health system (Sweden)	2006-2019	≈ 75000*	27%**
2	(Petzke et al., 2025a)	Australia	CKD stage 3 or higher	General Practice setting (EHR-GP)	2018 - 2022	18401	43.6%†
3	(Bothe et al., 2025)	Germany	CKD stage 3 or higher (Over 70 years)	Insurance data	2012-2018	≈ 4200 (Depending on year)	≈12% (Depending on year and age group)
4	(Naranjo et al., 2021)	United States	eGFR <60 ml/min per 1.73 m^2	Electronic Health records (39 HCOs)	2010 - 2013	976299	17.6%*** 21.6** 23.2††

Based on estimated CKD prevalence of 4.5%. **Over the last two years; * Over the last one year, †Over the last 1.5 years; †† Over the last 3 years; CKD: Chronic Kidney Disease; ACR: albumin:creatinine ratio; EHR-GP: Electronic Health Records from General Practitioners practices; HCO: Healthcare organisations*

Across four such studies of large sample size (summarized in Table 4), the proportion of CKD patients with albuminuria testing varied widely. A study in Sweden (Carrero & Elinder, 2022) reported that only

27% of patients with CKD had an ACR assessment within the preceding two years, despite universal health coverage. A more recent analysis from Australia (state of Victoria) (Petzke et al., 2025a) indicates substantially higher ACR testing levels, with 43.6% of stage 3+ CKD patients in general practice receiving ACR testing over 1.5 years. In contrast, insurance data from north-eastern Germany showed consistently low uptake, with approximately 12% of older adults with stage 3+ CKD tested annually. Similarly, a large United States (US) EHR study (Naranjo et al., 2021) demonstrated limited adherence, with ACR testing ranging from 17.6% within one year to 23.2% within three years among patients with eGFR <60 mL/min/1.73 m². Finally, based on data from the most recent (year 2023) annual report of the UK Renal Registry, the percentage of CKD patients with proteinuria data (either PCR or ACR) was 45.9% (UK Renal Registry (2025) UK Renal Registry Summary of Annual Report - data to 31/12/2023, Bristol, UK.). Collectively, these findings highlight substantial international gaps in guideline-recommended albuminuria assessment for CKD and demonstrate that overall adherence is low. Slightly better results were presented in a recent meta-analysis that included various combinations of 24-hour uACR (urine albumin urine albumin:creatinine ratio), uPCR (urine protein:creatininie ratio), spot urine proteinuria and dipstick testing, and for a wider time window (up to 24 months following the last measurement). Specifically, pooling results from 12 studies resulted in a proportion of CKD patients with albuminuria testing equal to 47.4% (95% CI: 40.0% to 54.7%), which varied widely across the studies (I^2=99%; 95% Prediction Interval: 15% to 79%) (Ketema et al., 2025). Nevertheless, some of the papers included in the meta-analysis excluded patients with CKD on dialysis, as dialysis patients may not need assessment of ACR on annual basis and many of these patients are already anuric. In the case of NICE indicator NM109 as applied in the UK and adapted for Cyprus, CKD patients undergoing dialysis were included in the denominator and this reduces the estimated compliance with the indicator. Although the percentage of dialysis CKD patients among the overall CKD population in Cyprus is low (≈1000 patients, 2% of the total CKD population) and its impact on the indicator value is expected to be small, it will always prevent 100% adherence to the indicator. Future analyses should exclude CKD patients on dialysis from the calculation of this indicator performance.

Overall, when compared against these international estimates, Cyprus appears to be in the mid-range. During the reporting period, 33.7% of CKD-coded patients in Cyprus had an ACR or PCR measurement recorded, already exceeding the proportions reported in Sweden, Germany, and the United States, and approaching those observed in Australia and the UK. Following implementation of the national CKD guideline, testing rates increased to 41.8%, placing Cyprus among the highest-performing settings identified in the review. This improvement suggests uptake of guideline recommendations to some

effect. However, ACR is not monitored routinely in more than half of CKD patients in Cyprus, indicating that gaps remain and guideline implementation needs to be further strengthened.

Synthesis of findings for indicator NM213: *The percentage of CKD coded patients, who are currently treated with a lipid lowering therapy.*

Cardiovascular disease (CVD) remains the leading cause of morbidity and mortality among individuals with CKD, accounting for a significant proportion of premature deaths. Not surprisingly, CKD activates multiple multifactorial biological mechanisms (often interlinked) that help explain the heightened CVD risk seen in affected individuals, even at early disease stages. For instance, CKD can intensify systemic inflammation and oxidative stress, which in turn drive atherosclerosis, vascular calcification and increased arterial stiffness, all changes that substantially elevate cardiovascular risk. CKD and CVD also share common underlying risk factors such as hypertension, diabetes, obesity and lipid abnormalities with the renin-angiotensin-aldosterone system (RAAS) being one of the key pathways involved (Matsushita et al., 2022). Dyslipidaemia in CKD is typically characterized by elevated triglycerides, low levels of high-density lipoprotein (HDL) cholesterol, and the accumulation of atherogenic remnant lipoproteins. These alterations emerge early in CKD and become more pronounced with advancing stages of renal impairment. Robust evidence from randomized clinical trials and large observational cohorts shows that lipid-lowering therapy, particularly statins, reduces significantly major atherosclerotic cardiovascular events (ASCVD) in CKD stages 1-4. For example, the SHARP trial (Study of Heart and Renal Protection) (Baigent et al., 2011) confirmed a lipid-lowering therapy with simvastatin plus ezetimibe could significantly lower the risk of any major coronary event (coronary events, non-haemorrhagic stroke, revascularization procedures) in CKD patients by 17% while a recent meta-analysis of 18 studies focusing on statin therapy and lipid indices in CKD, demonstrated a significant reduction in LDL cholesterol (Weighted Mean Difference - WMD: –27.81 mg/dL; 95% Confidence Interval-CI: –34.47 to –21.15; $p < 0.001$) and total cholesterol (WMD: –25.44 mg/dL; 95% CI: –34.71 to –16.18; $p < 0.001$) in patients with CKD compared with controls, although the reduction in triglycerides was not statistically significant (Karami et al., 2024).

Reflecting this evidence, NICE NG203 guideline “Chronic kidney disease: assessment and management” recommends administration of atorvastatin for the primary or secondary prevention of CVD to people with CKD. Additionally, if the person is taking the maximum tolerated dose and intensity of statin but the lipid target for secondary prevention of CVD is not met, clinicians are advised

to consider additional lipid-lowering treatments such as ezetimibe or PCSK9 activity inhibitors such as evolocumab or PCSK9 synthesis inhibitors such as inclisiran. In the same line, the KDIGO lipid management guidelines recommend that all adults non-dialysis-dependent CKD patients aged ≥50 years should receive a statin (or statin/ezetimibe combination), regardless of cholesterol concentration or estimated cardiovascular risk, given the very high baseline event rate in this population. For younger adults (18-49 years) with CKD, statin therapy is also advised if they have diabetes, known coronary disease, prior stroke, or an estimated 10-year coronary risk above 10% (Eknoyman et al., 2013).To this effect, the NM213 indicator serves as a direct measure of guideline adherence and of the system's capacity to deliver cardiovascular risk reduction to a population at high baseline risk. Solid performance on this indicator implies strong integration between nephrology and primary care in preventive management, while low performance may reveal poor long-term management of CKD. Because lipid-lowering therapy is low-cost, safe, and widely available, this indicator represents a high-impact, achievable quality target for improving long-term cardiovascular and renal outcomes in CKD.

To compare the Cyprus NM213 indicator results with corresponding evidence from other settings, the narrative review focused on large nationwide, registry-based or multicenter studies. Table 5 summarizes key information extracted from characteristic studies (including the proportion of CKD patients treated with a lipid lowering therapy) and findings are narratively discussed below.

Table 5: Studies reporting the percentage of CKD patients who are treated with a lipid lowering therapy

#	Author (year)	Country	Chronic Kidney Disease (CKD) patient group	Population	Time period	Sample	Type of lipid lowering therapy used	Proportion of CKD patients treated with a lipid lowering therapy
1	(Jenssen et al., 2025)	Norway	CKD patients ≥18 years old (14% were 1-2 stages)	Nationwide registry study	2021 – 2022	125163	Statins	50%
2	(Chu et al., 2021)	US	Adults with CKD	Medicare Advantage insurance claims data	2012 to 2019	452238	Statins	Hispanic: 74.1% Asians: 72.6% Blacks: 69.1% Whites 61.5%
3	(Petzke et al., 2025a)	Australia	CKD (stage ≥3) between 50 and 80 yrs/old	General Practice setting	2018 - 2022	18401	Statins	57.7%

				(EHR-GP)				
4	(Nakano et al., 2021)	Japan	Non-dialysis-dependent CKD patients ≥16 years old	Multicenter cohort (registry)	2013 - 2017	4476	Statins, Ezetimibe, Fibrates	Total: 42.45% 37.6% statins 3.6% ezetimibe 1.25% fibrates
5	(Van Oosten et al., 2021)	Netherlands	Adults with CKD (stages 4,5)	Nationwide insurance claims data	2017	14905	Statins	52.8%
6	(Huaira et al., 2018)	Brazil	Non-dialysis CKD patients ≥18 years old	Regional Healthcare system registry (EHR)	2010 - 2014	1977	Statins, Fibrates	Total: 71.2% • 60.7% statins • 10.5% fibrates

CKD: Chronic Kidney Disease; EHR: Electronic Health Records; EHR-GP: Electronic Health Records from General Practitioners practices

Among several studies identified in the literature, six characteristics studies from Europe, North and South America, Asia, and Australia are summarised. Across these studies, the proportion of patients with CKD receiving lipid-lowering therapy varied considerably, possibly reflecting differences in study populations, CKD stage, healthcare settings, and calendar periods. Statins were the predominant lipid-lowering therapy in all studies, while the use of non-statin agents was reported only in selected cohorts. In Norway, a research team (Jenssen et al., 2025) used nationwide registry data from 2021-2022 and found that 50% of adults with CKD were treated with statins, despite a proportion having early-stage (stages 1-2) disease. In the United States, researchers (Chu et al., 2021) analysed Medicare Advantage claims data from 2012-2019 and reported substantial ethnic variation in statin use, ranging from 61.5% among White patients to over 74% among Hispanic patients, highlighting disparities within a large insured population. In Australia, another research team (Petzke et al., 2025b) examined electronic health records from general practice and found that 57.7% of adults aged 50-80 years with CKD stage ≥3 were prescribed statins. Similarly, a Dutch nationwide claims study, also focusing on advanced CKD stages (stages 4-5), reported statin use in 52.8% of patients (Van Oosten et al., 2021). Lower treatment rates were observed in Japan, where researchers (Nakano et al., 2021) reported an overall lipid-lowering therapy use of 42.5%, with most patients receiving statins and only small proportions receiving ezetimibe or fibrates. However, in that registry study, CKD patients undergoing dialysis were excluded, thus the population reflects patients with less advanced CKD. Nevertheless, another pre-dialysis registry study (Huaira et al., 2018) reported much higher lipid lowering treatment rates (71.2%) in Brazil.

Overall, these studies highlight considerable underuse of lipid-lowering therapy in CKD, despite strong evidence of cardiovascular benefit. At the same time, there was marked international and population-level heterogeneity. It is possible that the use of lipid-lowering therapy does not cover all CKD patients, possibly due to safety concerns (e.g., polypharmacy, altered drug clearance), limited guideline implementation, and competing therapeutic priorities in patients with several comorbidities. Of note, are the results of the recent systematic review and meta-analysis conducted by Ketema et al. that identified 29 studies reporting statin use in CKD, with data from 15 studies (n=837885) being included in the meta-analysis. Despite more relaxed inclusion criteria (all observational studies - not only limited to administrative datasets), the findings are also in line with underuse of lipid-lowering therapy in CKD and significant international heterogeneity. Particularly, the pooled statin use rate was 56.6% (95% CI: 48.9% to 64.4%), varying widely across studies (I^2=99%; 95% Prediction Interval: 19% to 94%) (Ketema et al., 2025). This is not surprising as the CKD populations included in the meta-analysis were heterogeneous and differences in prescription could also be attributed to variations in a range of patient, clinician and health system-level barriers (Ketema et al., 2025). Furthermore, while lipid lowering therapy is indicated in proteinuric CKD patients, it may not be applicable in patients with other causes of CKD, such as polycystic kidney disease, medullary cystic disease, acquired single kidney (post nephrectomy) and interstitial nephritis, especially if the patients have no hyperlipidemia or other cardiovascular risk factors. Similarly, in Cyprus, indicator NM213 is calculated for all CKD coded patients (stage ≥3) and as such is comparable to the similar estimates from the international literature. However, it is possible that some patients included in the denominator may not require lipid lowering therapy administration and future (subgroup) analyses could also include estimation of the indicator NM213 separately for proteinuric and non-proteinuric CKD.

Overall, compared with the international evidence, Cyprus demonstrates a broadly comparable profile of lipid-lowering therapy use among patients with CKD. Prior to guideline implementation, 58.5% of CKD patients in Cyprus were receiving lipid-lowering treatment, a proportion that is similar to or higher than estimates reported in Norway, Australia, the Netherlands and Japan, and within the range observed in large international cohorts. Following implementation of the contextualized guideline, the corresponding estimate is slightly lower (56.7%) than the baseline, however it remained consistent with international practice patterns and suggests that Cyprus already had moderate uptake of lipid-lowering therapy prior to guidelineimplentation. However, given the notable cardiovascular risk associated with CKD and the higher treatment proportions reported in some settings, these findings indicate the need for further improvement.

Synthesis of findings for indicator NM214: *The percentage of patients without a CKD code who have been prescribed long-term (chronic) oral non-steroidal anti-inflammatory drugs (NSAIDs) and who have had an eGFR measurement in the previous 12 months.*

Chronic use of non-steroidal anti-inflammatory drugs (NSAIDs) is a cause of acute kidney injury (AKI), progressive CKD, hyperkalemia, hyponatremia, nephrotic syndrome and progression of chronic kidney disease (Baker & Perazella, 2020). NSAIDs may also have nephrotoxic effects including a decrease in GFR through a reduction in prostaglandin-dependent kidney blood flow, allergic interstitial nephritis (AIN), and nephrotic syndrome (KDIGO, 2024). In susceptible individuals [e.g., those with pre-existing hypertension, diabetes mellitus, heart failure, or concomitant use of renin-angiotensin system (RAS) blockers] these effects can precipitate sustained reductions in glomerular filtration rate, interstitial nephritis, and papillary necrosis (KDIGO, 2024). As such the contextualized guideline NG203 "Chronic kidney disease: assessment and management" includes the recommendations to assess GFR at least annually in adults, children and young people who are taking medicines that can adversely affect kidney function, such as non-steroidal anti-inflammatory drugs (long-term chronic use of NSAIDs). Regular monitoring enables clinicians to detect early functional decline, review ongoing NSAID necessity, and substitute safer analgesic options when appropriate.

Epidemiological data show an increased risk of kidney injury with both short-term and chronic NSAID exposure. A large population-based study from Hong Kong, demonstrated that chronic NSAID use is associated with ≥30% decline in eGFR after a mean follow-up of 6.3 years compared to those who did not use NSAID (Wan et al., 2021). The same study showed that NSAID treatment was associated with elevated risk of incident eGFR <60mL/min per 1.73m^2. Additional studies have also demonstrated that NSAID usage can lead to acute kidney injury and, with long-term usage to CKD among other renal-related conditions (Klomjit & Ungprasert, 2022) and identified that the main mechanism of these adverse effects is cyclooxygenase enzyme inhibition (LaForge et al., 2023). Despite this evidence, NSAID use remains common in community and primary-care settings, often without adequate renal monitoring or risk stratification.

The NM214 indicator captures this preventive aspect of renal safety by quantifying the proportion of non-CKD patients who have been prescribed chronic use of NSAID therapy and have had an eGFR measurement recorded within the preceding 12 months. This measure serves as a proxy measure of safe prescribing practices which include biomarker monitoring within routine medication

management. Higher values of this indicator reflect proactive monitoring and the high likelihood of early detection of CKD among at-risk beneficiaries. On the contrary, a low value suggests missed opportunities to prevent drug-induced renal injury and highlights potential gaps in practice related to patient safety.

To carry out comparisons with the Cyprus NM214 indicator output, the narrative review aimed to identify large, nationwide, registry-based or multicentre studies reporting the proportion of non-CKD individuals tested for eGFR. However, relevant studies were very few and not directly comparable with the indicator, as calculated in Cyprus. Most of the identified studies did not specifically define long-term use of NSAIDs and renal function assessment was not specifically carried out via measurement of eGFR. For example, in a very large study based on administrative data (n=138333), Bansal et al reported that almost all (94%) of non-CKD individuals with a history of NSAID prescription, covered by the Veteran Affairs Health Care System Primary Care Clinics, were screened for CKD using eGFR (Bansal et al., 2020). However, a single record of NSAID prescription between the time of cohort entry and the last visit date in that study was used to categorise them as NSAID users. As such, this study is not directly comparable to indicator NM214. A Spanish study, utilizing electronic health records from a single primary care setting, reported much lower proportions of screening of renal function among NSAID users (n= 450) with 129 patients (28.7%) having a renal function assessment at least once following NSAID prescription. However, NSAID prescription was not for long-term use and renal function assessment was carried out using serum creatinine and not eGFR (De Pablo Lopez De Abechuco et al., 2012).

Focusing on Cyprus, the increase observed for indicator NM214 following the contextualized guideline implementation is substantial and potentially clinically meaningful. The proportion of patients without a CKD diagnosis who were prescribed long-term oral NSAIDs and had an eGFR measurement within the previous 12 months rose from 5.6% at baseline to 51.1% post-implementation, representing a marked improvement in renal safety monitoring in this group. The magnitude of this increase highlights the likely impact of the guideline on clinician’s awareness and improved adherence to recommendations for routine kidney function assessment in high-risk groups. Nevertheless, despite this notable progress, the post-implementation level remains suboptimal as nearly half of patients receiving chronic NSAID therapy still lack documented renal function monitoring within the recommended timeframe. As this indicator reflects a patient safety issue, further efforts are required to strengthen implementation of this recommendation.

Synthesis of findings for indicator NM84: *The percentage of CKD patients who have hypertension and proteinuria and who are currently being treated with an angiotensin-receptor blocker (ARB) or an angiotensin-converting enzyme (ACE) inhibitor.*

Proteinuria, as well as the more specific measurement of albuminuria, is one of the core predictors of progression, cardiovascular morbidity, and mortality in both diabetic and non-diabetic CKD patients and it provides a quantitative marker of glomerular damage. When proteinuria or albuminuria reaches high levels, reflecting heavy urinary protein excretion, it indicates severe glomerular injury, ongoing intraglomerular hypertension, and heightened activation of the renin-angiotensin-aldosterone system (RAAS). Patients with heavy proteinuria are at high risk of progression to end-stage kidney disease and premature cardiovascular mortality (KDIGO, 2024; Matsushita et al., 2022; Yaqoob et al., 2025).

The renin-angiotensin system blockade with angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARB) has long been widely used for the therapy of proteinuria in CKD. By reducing intraglomerular pressure and modulating efferent arteriolar tone, ACE/ARB therapy lowers albuminuria and slows the rate of GFR decline. Randomized controlled trials, including the REIN (Ruggenenti et al., 1998) and AASK (Wright et al., 2002) studies, demonstrated substantial renal-protective effects of ACE/ARB therapy in non-diabetic CKD proteinuria. These findings were later confirmed in meta-analyses showing that ACE/ARB treatment reduces the relative risk of kidney failure or doubling of serum creatinine by roughly 30-40%, compared with placebo or other antihypertensive classes.

Guidelines including the *KDIGO 2021 Clinical Practice Guideline for Blood Pressure Management in CKD* recommend the use of an ACE inhibitor or ARB in all adults with CKD who present with moderately to severely increased albuminuria, unless contraindicated by hyperkalaemia, advanced renal failure, or bilateral renal artery stenosis. Similarly, the contextualized NICE NG203 guideline recommends offering ARB or an ACE inhibitor (titrated to the highest licensed dose that the person can tolerate) to adults, children and young people with CKD who have hypertension and an ACR over 300 mg/g (ACR category A3 or above). As such the NM84 indicator targets a particularly high-risk group: CKD patients with hypertension and proteinuria. Measuring the percentage of the patients who are currently treated with an ACE inhibitor or ARB provides a clear marker of quality of care, as it reflects adherence to a universally accepted, evidence-based intervention that demonstrably slows renal decline and reduces cardiovascular events. A high NM84 indicator value should be considered indicative of effective risk identification and management, whereas a low value underlines missed opportunities for nephroprotection and cardiovascular prevention.

Table 6: Studies reporting the percentage of CKD patients having hypertension and proteinuria and are treated with an ARB or an ACE inhibitor

#	Author (year)	Country	Chronic Kidney Disease (CKD) patient group	Population	Time period	Sample	ACEi or ARB	Proportion of CKD with proteinuria and hypertension treated with ACEi or ARB
1	(Chu et al., 2021)	United States	Adults With Albuminuria and hypertension (not specifically CKD)	NHANES database	2001 - 2018	849	ACEi or ARB	43.6% (2001-06) 53.1% (2007-12) 47.5% (2013-18)
2	(Van Oosten et al., 2021)	Netherlands	Adults with CKD (stages 4,5)	Nationwide insurance claims data	2017	14905	ACEi or ARB	ACEi: 23.6% ARB: 27.9%
3	(Petzke et al., 2025b)	Australia	CKD (stage ≥3) who had albuminuria and a recorded diagnosis of diabetes	General Practice setting (EHR-GP)	2018 - 2022	18401	ACEi or ARB	68.7%
4	(Tada et al., 2025)	Japan	All CKD patients with hypertension and proteinuria*	DeSC database (several insurance systems)	2020 - 2021	34362	ACEi or ARB	28%
5	(McCoy et al., 2021)	US	All CKD and proteinuria	Nationwide database of insurance claims	2017	41743	ACEi or ARB	49%

*ACEi: angiotensin-converting enzyme inhibitors; ARBs: angiotensin II receptor blockers; CKD: Chronic Kidney Disease; NHANES: National Health and Nutrition Examination Surveys; EHR: Electronic Health Records; EHR-GP: Electronic Health Records from General Practitioners practices; *aged <75 years with CKD stage G1–G5 with urinary protein ≥1+ or aged ≥75 years with CKD stage G1–G3 with urinary protein ≥1+*

The narrative review did identify several studies that reported the proportion of ACEi or ARB use in CKD but not always in a subset of CKD patients with both proteinuria and hypertension as these were rarer. Characteristic examples of such studies are included in Table 6. For instance, in the United States, Chu et al., using NHANES data from 2001-2018, reported that among adults with albuminuria and hypertension, ACEi/ARB use was 43.6% in 2001-2006, increasing to 53.1% in 2007-2012, before declining again to 47.5% in 2013-2018 (Chu et al., 2021). These estimates were very close to the findings of another US study by McCoy et al. based on claims data that found that 49% of CKD patients

with proteinuria were treated with an ACEi or ARB in 2017 (McCoy et al., 2021). In Europe, van Oosten et al. (2021) reported comparable use in advanced CKD: among 14905 Dutch patients with CKD stages 4–5, 23.6% received an ACE inhibitor and 27.9% an ARB in 2017. Given that instances of patients taking both medications are not common, the overall proportion of treatment with either ACEi or ARB is close to 50%. The only study that reported higher treatment rates with ACEi or ARB was the one by Petzke et al. in Australia that reported 68.7% of CKD stage ≥3 patients with albuminuria and diabetes in general practice (2018-2022) were treated with ACEi/ARB therapy. However, that study reported this proportion specifically for CKD patients with albuminuria and diabetes and hypertension status in that cohort was unknown (Petzke et al., 2025a). In contrast, Tada et al., analysing Japanese insurance data, reported that only 28% of CKD patients with hypertension and proteinuria were treated with ACEi or ARBs in 2020-2021 (Tada et al., 2025). Overall, these findings indicate substantial international variability in the use of ACE inhibitors or ARBs among CKD patients with proteinuria and hypertension, reflecting differences in populations, disease severity, and healthcare systems despite strong guideline recommendations. Furthermore, as indicated by McKoy et al., discontinuing, rather than never initiating, was the main reason for low proportion pf ARB or ACEi treatment in CKD, as, while only 49% of patients had an active ACEi/ARB prescription at the evaluation date, many more (87%) had been previously prescribed an ACEi/ARB. This may indicate that discontinuation of ACEi/ARB treatment, potentially driven by safety concerns or disease progression, is a major contributor to low prevalence of ACEi/ARB treatment, rather than failure to initiate treatment in eligible patients.

In Cyprus the corresponding proportions of ACE inhibitor or ARB use among CKD patients with hypertension and proteinuria were 63.3% in the baseline period and 61.7% following guideline implementation, indicating only a small reduction between the two time points. Overall, these levels of uptake suggest that adherence to RAAS blockade recommendations in this setting is already higher than that reported in many international cohorts, where treatment proportions commonly ranged between 28% and 53%. This finding implies that prescribing of ACEi/ARB treatment for this high-risk CKD subgroup was relatively well established even before formal guideline implementation and coincided with the HIO policy to set prescription of ACEi/ARB as prerequisite before the prescription of Sodium-Glucose Co-Transporter 2 (SGLT2) inhibitors or Finernone to CKD patients in GESY. Nevertheless, despite this comparatively favorable picture, there remains clear scope for further improvement, particularly given the strong evidence supporting sustained ACEi/ARB treatment for nephroprotection and cardiovascular risk reduction. Targeted efforts to minimize inappropriate treatment discontinuation and optimise monitoring of kidney function and potassium levels, may further strengthen performance on this indicator.

Suggestions for further improvement in quality of care

Towards improving quality of care in Cyprus for HIO beneficiaries, it is important to consider appropriate strategies or interventions to improve adherence to the contextualized NG203 guideline and decelerate CKD disease progression. These suggestions may include administrative and organizational activities falling under the 5 categories listed below:

1. Overall enhancement of guideline awareness and training on recommendations
    a. Among healthcare practitioners
    b. Among patients and caregivers
2. Routine assessment of barriers to guideline implementation by HIO
3. Adherence by primary care physicians and nephrologists in the annual testing for urine albumin:creatinine (or protein:creatinine) (NM109)
4. Prevent onset of renal diseases and long-term kidney damage in long-term users of NSAIDs (NM214)
5. Uptake and continuation of treatment with ARB_s in CKD patients with hypertension and albuminuria and/or proteinuria (NM247 & NM84)

Activities included in the first two categories are horizontal (across the full guideline scope and all indicators) while activities under the remaining categories are specific to indicators NM109, NM214, NM247 and NM84. Horizontal activities could include:

- **Guideline education sessions and training**
    - Note: Education and training through seminars and targeted workshops in annual meetings of the Cyprus Renal Association, Cyprus Association of Family Doctors and Cyprus Society of General Medicine and Primary Care Physicians. HIO could undertake online training activities and publication of relevant educational material in association with the Cyprus Renal Association.
- **Enhancement of patient knowledge and empowerment**
    - Note: Educating patients about the benefits of adherence to guideline recommendations and the importance of patient adherence to evidence-based treatment is expected to further facilitate uptake of guideline recommendations, particularly by limiting progression to end-stage renal disease and promoting cardiovascular event prevention in this high-risk population.
- **Address barriers to guideline adherence**

  - Note: Via surveys, data analysis based on the HIO IT system or other methods (e.g., interviews and focus groups), identify suitable and cost-effective options to improve guideline adherence.
- **Offer incentives to healthcare providers**
  - Note: Enhance adherence to guideline recommendations, primarily those monitored by quality indicators (including those addressing renal function monitoring and lipid-lowering therapy), using incentives for general practitioners or specialists.

More specific suggestions are applicable to particular indicators. For example, to promote adherence by primary care physicians and nephrologists in the annual testing for urine albumin:creatinine (or protein:creatinine) ratio in all CKD patients, the following measures could be implemented:

- **Enhance communication between specialists and primary care physicians caring for the same patient to ensure urine ACR has been tested each year.**
  - Note: Improved communication can be established by increasing awareness between both primary care physicians and specialists about this unmet need, as well as through the development of clear recommendations for communication when a specialist diagnoses CKD, ensuring primary care physicians receive timely updates regarding disease diagnosis.
- **Patient specific reminders/notifications can be implemented on annual basis.**
  - Note: Patient specific notifications on an annual basis via the HIO IT system could alert both primary care physicians and specialists about missing urine ACR in the last 12 months

Furthermore, to further prevent onset of renal diseases and long-term kidney damage, it is important to consider appropriate strategies to improve evaluation of renal function through eGFR measurement in those who use NSAIDs in the primary care setting as well as limiting use of NSAIDs where possible.

These strategies could include:

- **Implement a computerized decision support tool that utilizes the data available in the HIO IT system (including the duration of NSAIDs prescription e.g., for more than 6 months) and alerts the clinician (i.e., general practitioner) about patients who use NSAIDs chronically and should have a blood test for eGFR.**
    - Note: This suggestion aims to capture all beneficiaries who use NSAIDs chronically and notify the general practitioners regarding their patient's need for renal function annual evaluation.
- **Provision of printed educational material including information regarding the requirement of renal function evaluation in patients who use NSAIDs chronically and should have a test for eGFR.**
    - Note: This material should be administered to all primary care providers and medical centers providing primary healthcare services.
- **Inform beneficiaries via social media infographics or graphical videos regarding the risks of long-term NSAID use as well as the need for eGFR testing in those who use NSAIDs chronically.**
    - Note: This suggestion aims to inform beneficiaries, who may use frequently NSAID drugs (e.g., ibuprofen over the counter) for inflammatory pain but have no doctor prescription. Through this measure, beneficiaries without available data on NSAID use in the HIO IT system will be informed about the risks associated with long-term NSAID use and the importance of renal function testing.

Lastly, to improve appropriate treatment with ACE inhibitors or ACE in CKD patients, depending on albuminuria/proteinuria and other comorbidities (i.e., hypertension), these steps could be undertaken:

- **Implement a computerized decision support tool that utilizes the data available in the HIO IT system (including the identification of an albuminuria >300mg/g or proteinuria) and alert the clinician (i.e., general practitioner, nephrologist) about the potential need for an ACE inhibitor or ARB to be prescribed to this patient.**
    - Note: This suggestion aims to capture all beneficiaries having macroalbuminuria and/ or proteinuria and notify the general practitioners/nephrologists regarding their patient's potential need for ACE inhibitor or ARB. Final decision is taken by the doctor, who should investigate further contraindications for the prescription.

Summary

This report presents the first comprehensive assessment of selected quality indicators following the implementation of the contextualized NICE NG203 "Chronic Kidney Disease: assessment and management" guideline within the Cyprus General Health System (GESY). Overall, the findings indicate that most indicators demonstrated meaningful improvement between the baseline (pre-implementation) and reporting (post-implementation) periods, suggesting early positive effects of guideline adoption and increased awareness of evidence-based CKD care. Notable improvements were observed for indicators capturing diagnostic monitoring and patient safety, including NM109 (annual urine ACR/PCR testing), which increased from 33.7% to 41.8%, NM216 (timely eGFR and ACR testing around diagnosis), which rose from 15.8% to 37.5%, and NM215 (confirmation of CKD diagnosis with repeat eGFR testing), which increased from 10.0% to 24.3%. The most noticeable improvement was seen for NM214 (renal function monitoring among chronic NSAID users without CKD), which rose substantially from 5.6% to 51.1%, highlighting a major gain in preventive practices.

Indicators related to pharmacological management showed a more stable pattern. NM213 (lipid-lowering therapy use) and NM84 (ACEi/ARB treatment among CKD patients with hypertension and proteinuria) exhibited only small declines after implementation, with changes that were either modest or not statistically significant. Importantly, baseline levels for these indicators were already relatively high, suggesting established evidence-based prescribing practices prior to guideline implementation.

Across indicators where international comparisons were possible, Cyprus estimates were broadly in line with, or favourable compared to, those reported in other countries, including large registry-based studies from Europe, North America, Asia, and Australia. Taken together, these findings indicate that while substantial gaps remain, particularly in diagnostic timeliness and universal uptake of recommended therapies, the overall quality of CKD care in Cyprus is comparable to international standards and shows promising early improvements following guideline implementation. This is particularly important given that, unlike many healthcare systems with more established quality improvement infrastructures, Cyprus has had relatively limited experience with the systematic implementation and monitoring of clinical guidelines. Continued monitoring of these indicators over subsequent reporting periods will be essential to confirm the sustainability of observed improvements, identify emerging trends, and guide targeted actions to further strengthen the quality of CKD care within the Cyprus health system.

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APPENDIX I

Indicator NM109

The percentage of CKD coded patients, whose notes have a record of referral for a urine albumin:creatinine ratio (or protein:creatinine ratio) test in the preceding 12 months.

Indicator type

General practice indicator.

Rationale

This indicator measures the percentage of people with chronic kidney disease (CKD) who have an annual urine albumin:creatinine ratio (ACR) or protein:creatinine ratio (PCR) test. The aim is to ensure monitoring of the severity of kidney damage in people with CKD. Good evidence shows proteinuria is associated with adverse outcomes and that proteinuria measurement enables appropriate management of CKD. The NICE guideline for chronic kidney disease recommends using ACR in preference to PCR because of its greater sensitivity. PCR is only recommended as an alternative to ACR to monitor high levels of proteinuria (ACR ≥500 mg/gr), but not for people with diabetes. The guideline states that the frequency of ACR monitoring should be agreed with the person but based on the severity of CKD. Recommended frequencies of monitoring range from once a year in people with CKD class G3, to 4 or more times a year in people with CKD class G5. For the purposes of a primary care indicator, annual ACR or PCR testing is considered appropriate, because it will be applied to CKD coded patients of classes G3-G5.

Specification

Numerator: The number of patients in the denominator whose notes have a record of a urine albumin:creatinine ratio (or a protein:creatinine ratio) test in the preceding 12 months.

Denominator: The number of CKD coded patients.

Calculation: (Numerator/denominator)*100.

Exclusions: Patients with CKD category G1 or G2, that do not have the following risk factors: persistent invisible hematuria, structural renal abnormalities (such single kidney, horseshoe kidney, nephrocalcinosis, renal stones disease, dysmorphic or pelvic kidneys), functional renal abnormalities (Nephrogenic diabetes insipidus, Renal Tubular Acidosis type 1 & 2) and hereditary renal diagnoses (familial cystic disease such as autosomal dominant polycystic disease, medullary cystic disease, tuberous sclerosis, von Hippel Lindau; Familial haematurias such as C3 glomerulopathy, CFHR5 nephropathy and thin basement membrane disease/Alport spectrum disease; Fabry's disease; nephronophthisis.

Minimum population: The indicator would be appropriate to assess performance at the level of general practitioners or specialist nephrologists

Indicator NM213

The percentage of CKD coded patients, who are currently treated with a lipid lowering therapy.

Indicator type

General practice indicator.

Rationale

People with chronic kidney disease (CKD) are at increased risk of cardiovascular disease (CVD). Lipid lowering therapies can help lower LDL cholesterol as part of primary and secondary prevention of CVD in people with CKD. Atorvastatin 20 mg, PCSK9 inhibitors and Inclisiran are all recommended as first line therapy for the primary and secondary prevention of CVD in people with CKD.

Specification

Numerator: The number in the denominator who are currently treated with a lipid lowering therapy such as Atorvastatin, PCSK9 inhibitors and Inclisiran.

Denominator: The number of CKD coded patients.

Calculation: Numerator divided by the denominator, multiplied by 100.

Exclusions: Patients with CKD category G1 or G2 or unspecified.

Personalised care adjustments or exception reporting should be considered to account for situations where the patient declines, does not attend or if lipid lowering therapy is not appropriate.

Minimum population: The indicator would be appropriate to assess performance at the level of general practitioners or specialist nephrologists

Indicator NM214

The percentage of non-CKD-coded patients prescribed long-term (chronic) oral non-steroidal anti-inflammatory drugs (NSAIDs) who have had an eGFR measurement in the preceding 12 months.

Indicator type

The indicator is appropriate to assess performance at the whole country level.

Rationale

Non-steroidal anti-inflammatory drugs (NSAIDs) are one of the most commonly prescribed drug groups in the UK and can adversely affect kidney function. Early detection of CKD in patients prescribed these medications long-term can help to prevent or delay progression and complications.

Specification

Numerator: The number of patients in the denominator who have had an eGFR (estimated Glomerular Filtration Rate) measurement in the preceding 12 months.

Denominator: The number of patients (excluding those on the CKD register) prescribed long-term (chronic) oral non-steroidal anti-inflammatory drugs (NSAIDs).

Definition: Long-term prescription is defined as 12 prescriptions in the preceding 24 months.

Calculation: (Numerator/denominator)*100.

Exclusions: None.

Personalised care adjustments or exception reporting should be considered to account for situations where the patient declines, does not attend or if measurement of eGFR is not appropriate.

Minimum population: The indicator is appropriate to assess performance at the whole country level.

Indicator NM215

The percentage of newly CKD coded patients with stage G3-G5, within the preceding 12 months, who had eGFR measured on at least 2 occasions separated by at least 90 days, and the second test within 90 days before the diagnosis.

Indicator type

General practice indicator.

Rationale

Chronic kidney disease (CKD) is a long-term condition characterised by abnormal kidney function or structure (or both) present for more than 3 months. Having two eGFR tests 90 days apart helps ensure appropriate advice, treatment and support can be provided and can help preserve kidney function and reduce the risk of developing comorbidity. It is noted that eGFR results from an acute secondary care episode should not be used to confirm the diagnosis of chronic kidney disease in this indicator.

Specification

Numerator: The number of patients in the denominator who had eGFR measured on at least 2 occasions separated by at least 90 days, and the second test within 90 days before the diagnosis.

Denominator: The number of newly CKD coded patients with stage G3-G5, within the preceding 12 months.

Calculation: (Numerator/denominator)*100.

Exclusions: Patients with CKD category G1 or G2 or unspecified.

Personalised care adjustments or exception reporting should be considered to account for situations where the patient declines, does not attend or if measurement of eGFR is not appropriate.

Minimum population: The indicator would be appropriate to assess performance at. the level of general practitioners or specialist nephrologists.

Indicator NM216

The percentage of newly CKD coded patients with stage G3-G5, within the preceding 12 months, who had eGFR and ACR (urine albumin to creatinine ratio) measurements recorded within 90 days before or after diagnosis.

Indicator type

General practice indicator.

Rationale

Chronic kidney disease (CKD) is a long-term condition characterised by abnormal function or structure (or both). A combination of estimated glomerular filtration rate (eGFR) and urine albumin to creatinine ratio (ACR) measurement can be used to estimate the risk of complications and can guide decisions for treatment. An increased risk of adverse outcomes in CKD is seen in people with decreased eGFR or increased ACR, or both.

Specification

Numerator: The number of patients in the denominator who had eGFR and ACR (urine albumin to creatinine ratio) measurements recorded within 90 days before or after diagnosis.

Denominator: The number of newly CKD coded patients with stage G3-G5, within the preceding 12 months.

Calculation: (Numerator/denominator)*100.

Exclusions: Patients with CKD category G1 or G2 or unspecified.

Personalised care adjustments or exception reporting should be considered to account for situations where the patient declines, does not attend or if measurement of eGFR or urine ACR is not appropriate.

Minimum population: The indicator would be appropriate to assess performance at the level of general practitioners or specialist nephrologists.

Indicator NM247

The percentage of CKD-coded patients and with an albumin to creatinine ratio (ACR) of 500 mg/gr or more, without diabetes, who are currently treated with an ARB or an ACE inhibitor.

Indicator type

The indicator is appropriate to assess performance at the whole country level.

Rationale

Chronic kidney disease (CKD) is a long-term condition characterised by abnormal function or structure (or both) and is an important public health problem associated with significant morbidity, premature mortality and high health care costs. Management of CKD aims to prevent or delay disease progression and the development of complications. Treatment with renin-angiotensin system antagonists such as ACE inhibitors and angiotensin II receptor blockers (ARB) for people with CKD can prevent or delay the progression of CKD, reduce or prevent the development of complications and reduce the risk of cardiovascular disease. People with diabetes have been excluded from the indicator.

Specification

Numerator: The number of patients in the denominator who are currently treated with an ARB or an ACE inhibitor.

Denominator: The number of CKD coded patients with an ACR of 500 mg/gr or more, without diabetes.

Calculation: Numerator divided by the denominator, multiplied by 100.

Definitions:

> Current treatment is defined as a prescription in the last 6 months of the reporting period.
> The last recorded reading of ACR should be used for inclusion in the denominator.

Exclusions: Patients with CKD category G1 or G2 or unspecified.

Personalised care adjustments or exception reporting should be considered to account for situations where the patient declines, does not attend or if prescription of ARBs or ACE inhibitors are not appropriate.

Minimum population: The indicator is appropriate to assess performance at the whole country level.

Indicator: NM84

The percentage of CKD-coded patients who have hypertension and proteinuria and who are currently being treated with an angiotensin-receptor blocker or an angiotensin-converting enzyme inhibitor.

Indicator type

General practice indicator.

Rationale

Treatment with renin-angiotensin system antagonists for people with CKD and hypertension can prevent or delay the progression of CKD, reduce or prevent the development of complications, and reduce the risk of cardiovascular disease.

Specification

Numerator: The number of patients in the denominator who are currently treated with renin-angiotensin system antagonists.

Denominator: The number of CKD coded patients with hypertension and proteinuria.

Calculation: (Numerator/denominator)*100.

Exclusions:

- Patients with CKD category G1 or G2 or unspecified.

Minimum population: The indicator is appropriate to assess performance at. the level of general practitioners or specialist nephrologists.

APPENDIX II: BUSINESS RULES

The draft "Business Rules" Appendix complements the contextualized NICE Guideline NG203 on "Chronic kidney disease: assessment and management" and can be used as an aid to understand the patient groups and activities included in each indicator output.

Important information: *The draft business rules format employed here follows the format described by NHS Digital described in the Business Rules Supporting Information (Version 1.2 – 01/04/2017) and consist of two main sections:*

- *Dataset specification*
    - *Qualifying Dates (number of dates to determine the relevant period(s) to extract data for and for identifying which activity to include in each extract)*
        - *Reporting Period Start Date (RPSD)*
        - *Reporting Period End Date (RPED)*
        - *Qualifying dates determine a quality service period for which the indicator is assessed. The quality service period can be defined differently using different RPSD and/or RPED, depending on the nature of data collection (cumulative data collection Vs non-cumulative data collection).*
    - *Patient selection criteria (definition of patient populations, further criteria define the clinical aspects of interest using appropriate internal, national, or international coding system in line with the format used in the HIO electronic system)*
        - *The patient selection criteria can be applied at the individual doctor level and/or GESY level.*
    - *Populations (Subsets of patients to which further logic rules may apply).*
    - *Clinical code clusters (may need to be specified for any dates associated with them to be identified)*
    - *Clinical data extraction criteria (data items to be exported from the HIO electronic system for subsequent processing)*

- *Data export – Output*
    - *Data exports are assigned a name and a description and state the population for which the logic rule(s) should be applied to.*
    - *The output forms an indicator which may comprise:*
        - *A single count of patients meeting the criteria*
        - *A numerator and denominator combination producing a fractional figure*
            - *Separate logic rules may be required to be specified for numerator and denominator populations*
        - *A Boolean TRUE/FALSE result*

Indicator NM109: The percentage of CKD coded patients, whose notes have a record of referral for a urine albumin:creatinine ratio (or protein:creatinine ratio) test in the preceding 12 months.

Indicator NM109 business rules:

Reporting period -> At the end of each year -> non-cumulative data collection

Reporting unit (minimum population) -> across the whole GESY, to access performance at individual general practice level or nephrologist specialist level.

RPSD = e.g. 01/01/2023

RPED = e.g. 31/12/2023

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF CKD = 1	Next Rule	Reject	Rule 1 allows the selection of all patients with a CKD diagnosis (coding depending on current HIO system configuration)
2	IF (CKD STAGE >= 3)	Select	Reject	Rule 2 allows the selection of subset of patients with a CKD stage 3-5 within the group of patients with CKD. This rule will also ensure exclusion of unspecified CKD stage (e.g. coded stage 0 or missing value)
End of denominator rules				

CKD= Chronic Kidney Disease diagnosis, CKD STAGE= Staging of CKD disease

Numerator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF (UR_ACR_REF = 1 OR UR_PCR_REF=1)	Next Rule	Reject	Rule 1 allows the selection of patients with at least one referral for urine albumin:creatinine ratio
2	IF ((UR_ACR_REF_DATE OR UR_PCR_REF_DATE) > RPED – 12 MONTHS)	Select	Reject	Rule 2 allows the selection of the subset of CKD patients with at least one ACR or PCR referral date within the preceding 12 months.
End of numerator rules				

UR_ACR_REF = Referral for urine albumin:creatinine ratio, UR_PCR_REF = Referral for urine protein:creatinine ratio, UR_ACR_REF_DATE = Date of Referral for urine albumin:creatinine ratio, UR_PCR_REF_DATE = Date of Referral for urine protein:creatinine ratio, RPED = Reporting Period End Date.

Indicator NM213: The percentage of CKD coded patients, who are currently treated with a lipid lowering therapy.

Indicator NM213 business rules:

Reporting period -> At the end of each year -> non-cumulative data collection

Reporting unit (minimum population) -> Depending on prescribing guidelines by Health Insurance Organisation

RPSD = e.g. 01/01/2023

RPED = e.g. 31/12/2023

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF CKD = 1	Next Rule	Reject	Rule 1 allows the selection of all patients with a CKD diagnosis (coding depending on current HIO system configuration)
2	IF (CKD STAGE >= 3)	Select	Reject	Rule 2 allows the selection of subset of patients with a CKD stage 3-5 within the group of patients with CKD. This rule will also ensure exclusion of unspecified CKD stage (e.g. coded stage 0 or missing value)
End of denominator rules				

CKD= Chronic Kidney Disease diagnosis, CKD STAGE= Staging of CKD disease

Numerator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF (ATO = 1 OR PCSK9 OR INCL=1)	Next Rule	Reject	Rule 1 allows the selection of patients with at least one prescription of lipid lowering therapy (Atorvastatin, PCSK9 inhibitors and Inclisiran)
2	IF (ATO_DATE OR PCSK9_DATE OR INCL_DATE > RPED – 6 MONTHS)	Select	Reject	Rule 2 allows the selection of the subset of patients that are currently treated with lipid lowering therapy (prescription within preceding six months)
End of numerator rules				

ATO = Atorvastatin prescription, PCSK9 = PCSK9 prescription, INCL = Inclisiran prescription, ATO_DATE = Date of Atorvastatin prescription, PCSK9_DATE = Date of PCSK9 prescription, INCL_DATE = Date of Inclisiran prescription, RPED = Reporting Period End Date

Indicator NM214: The percentage of non-CKD-coded patients prescribed long-term (chronic) oral non-steroidal anti-inflammatory drugs (NSAIDs) who have had an eGFR measurement in the preceding 12 months.

Indicator NM214 business rules:

Reporting period -> At the end of each year -> non-cumulative data collection

Reporting unit (minimum population) -> to assess performance at the whole country level.

RPSD = e.g. 01/01/2023

RPED = e.g. 31/12/2023

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF CKD = 0	Next Rule	Reject	Rule 1 allows the selection of all patients without CKD.
2	NSAID_PRESC = 1	Next Rule	Reject	Rule 2 allows the selection of subset of non-CKD patients with prescriptions of NSAID.
3	12 NSAID_PRESC_DATE > RPED - 24 MONTHS	Select	Reject	Rule 3 allows the selection of subset of non-CKD patients with chronic prescription of NSAID during the preceding 24 months
End of denominator rules				

CKD = Chronic Kidney Disease diagnosis, NSAID_PRESC = Prescription of NSAID, NSAID_PRESC_DATE = Date of prescription of NSAID, RPED = Reporting Period End Date

Numerator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	EGFR = 1	Next Rule	Reject	Rule 1 allows the selection of a subset of non-CKD patients with EGFR assessment
2	EGFR_DATE > RPED - 12 MONTHS	Select	Reject	Rule 2 allows the selection of subset of non-CKD patients with EGFR assessment in the preceding 12 months.
End of numerator rules				

EGFR = eGFR assessment, EGFR_DATE = Date of eGFR assessment, RPED = Reporting Period End Date

Indicator NM215: The percentage of newly CKD coded patients with stage G3-G5, within the preceding 12 months, who had eGFR measured on at least 2 occasions separated by at least 90 days, and the second test within 90 days before the diagnosis.

Indicator NM215 business rules:

Reporting period -> At the end of each year -> non-cumulative data collection

Reporting unit (minimum population) -> across the whole GESY, to assess performance at individual general practice level or nephrologist specialist level.

RPSD = e.g. 01/01/2023,

RPED = e.g. 31/12/2023

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF CKD = 1	Next Rule	Reject	Rule 1 allows the selection of all patients with a CKD diagnosis
2	IF (CKD_STAGE >= 3)	Next Rule	Reject	Rule 2 allows the selection of subset of patients with a CKD stage 3-5 within the group of patients with CKD. This rule will also ensure exclusion of unspecified CKD stage (e.g. coded stage 0 or missing value)
3	IF CKD_DATE > RPED-12 MONTHS	Select	Reject	Rule 3 allows the selection of subset of patients with CKD 3-5 that have been diagnosed in the last 12 months.
End of denominator rules				

CKD = Chronic Kidney Disease Diagnosis, CKD_STAGE = Staging of CKD disease, CKD_DATE = Date of CKD diagnosis, RPED = Reporting Period End Date

Numerator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF EGFR = 1	Next Rule	Reject	Rule 1 allows the selection of a subset of CKD patients with EGFR assessment
2	EGFR_DATE > CKD_DATE – 90 DAYS	Next Rule	Reject	Rule 2 allows the selection of a subset of CKD patients with eGFR performed within 90 days preceding the CKD diagnosis
3	EGFR >1	Next Rule	Reject	Rule 3 allows the selection of CKD patients with eGFR performed within 90 days preceding the CKD diagnosis, that had more than 1 EGFR during the reporting period

4	EGFR_DATE1 – EGFR_DATE2 > 90 DAYS	Select	Reject	Rule 4 allows the selection of CKD patients with eGFR performed within 90 days preceding the CKD diagnosis, that had more than 1 EGFR during the reporting period, and the last 2 GFR before CKD diagnosis were more than 90 days apart
End of numerator rules				

EGFR = eGFR assessment, EGFR_DATE = Date of eGFR assessment, CKD_DATE = Date of CKD diagnosis, EGFR_DATE1 = Date of last eGFR before CKD diagnosis, EGFR_DATE2 = The EGFR assessment preceding the last one before diagnosis

Indicator NM216: The percentage of newly CKD coded patients with stage G3-G5, within the preceding 12 months, who had eGFR and ACR (urine albumin to creatinine ratio) measurements recorded within 90 days before or after diagnosis.

Indicator NM216 business rules:

Reporting period -> At the end of each year -> non-cumulative data collection

Reporting unit (minimum population) -> across the whole GESY, to assess performance at individual general practice level or nephrologist specialist level.

RPSD = e.g. 01/01/2023, RPED = e.g. 31/12/2023

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF CKD = 1	Next Rule	Reject	Rule 1 allows the selection of all patients with a CKD diagnosis
2	IF (CKD_STAGE >= 3)	Next Rule	Reject	Rule 2 allows the selection of subset of patients with a CKD stage 3-5. This rule also ensures exclusion of unspecified CKD stage (e.g. coded stage 0 or missing value)
3	IF CKD_DATE > RPED-12 MONTHS	Select	Reject	Rule 3 allows the selection of subset of patients with CKD 3-5 that have been diagnosed in the last 3 months.
End of denominator rules				

CKD = Chronic Kidney Disease Diagnosis, CKD_STAGE = Staging of CKD disease, CKD_DATE = Date of CKD diagnosis, RPED = Reporting Period End Date

Numerator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF EGFR = 1 AND UR_ACR =1	Next Rule	Reject	Rule 1 allows the selection of a subset of CKD patients with both EGFR and urine ACR assessment
2	EGFR_DATE > CKD_DATE – 90 DAYS OR EGFR DATE < CKD DATE + 90 DAYS	Next Rule	Reject	Rule 2 allows the selection of a subset of CKD patients with eGFR performed within 90 days preceding the CKD diagnosis OR within 90 days after the CKD diagnosis
3	UR_ACR_DATE> CKD_DATE – 90 DAYS OR UR_ACR_DATE < CKD_DATE + 90 DAYS	Select	Reject	Rule 3 allows the selection of CKD patients with eGFR performed within 90 days before or after the CKD diagnosis, that had also 1 urine ACR during the same period
End of numerator rules				

EGFR = eGFR assessment, UR_ACR = Urine albumin to creatinine ratio, EGFR_DATE = Date of eGFR assessment, CKD_DATE = Date of CKD diagnosis, UR_ACR_DATE = Date of Urine albumin to creatinine ratio

Indicator NM247: The percentage of CKD-coded patients and with an albumin to creatinine ratio (ACR) of 500 mg/gr or more, without diabetes, who are currently treated with an ARB or an ACE inhibitor.

Indicator NM247 business rules:

Reporting period -> At the end of each year -> non-cumulative data collection

Reporting unit (minimum population) -> across the whole GESY, to assess performance at each individual specialist level.

RPSD = e.g 01/01/2023

RPED = e.g. 31/12/2023

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF CKD = 1	Next Rule	Reject	Rule 1 allows the selection of all patients with a CKD diagnosis
2	IF (CKD_STAGE >= 3)	Next Rule	Reject	Rule 2 allows the selection of subset of patients with a CKD stage 3-5. This rule also ensures exclusion of unspecified CKD stage (e.g. coded stage 0 or missing value)
3	IF (UR_ACR = 1 AND UR_ACR_LAST_VAL >= 500)	Next Rule	Reject	Rule 3 allows the selection of subset of patients with a CKD stage 3-5 with ACR value of 500 mg/gr or greater in their last recorded reading of ACR
4	IF DIAB = 0	Select	Reject	Rule 4 allows the selection of subset of patients with a CKD stage 3-5 with ACR value of 500 mg/gr or greater, without diabetes
End of denominator rules				

CKD = Chronic Kidney Disease Diagnosis, CKD_STAGE = Staging of CKD disease, UR_ACR = Urine albumin to creatinine ratio, UR_ACR_LAST_VAL = Value (result) of last recorded urine albumin to creatinine ratio assessment, DIAB = Diabetes diagnosis

Numerator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF (ARB = 1 OR ACE =1)	Next Rule	Reject	Rule 1 allows the selection of patients with at least one prescription of ARB or ACE inhibitor
2	IF (ARB_DATE OR ACE_DATE > RPED – 6 MONTHS)	Select	Reject	Rule 2 allows the selection of the subset of patients that are currently treated with ARB or ACE inhibitor (prescription within preceding six months)
End of numerator rules				

ARB = Prescription of ARB, ACE = Prescription of ACE, ARB_DATE = Date of ARB prescription, ACE_DATE = Date of ACE prescription, RPED = Reporting Period End Date

Indicator NM84: The percentage of CKD-coded patients who have hypertension and proteinuria and who are currently being treated with an angiotensin-receptor blocker or an angiotensin-converting enzyme inhibitor.

Indicator NM84 business rules:

Reporting period -> At the end of each year -> non-cumulative data collection

Reporting unit (minimum population) -> The indicator is appropriate to assess performance at individual general practice level or nephrologist specialist level.

RPSD = e.g 01/01/2023

RPED = e.g. 31/12/2023

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF CKD = 1	Next Rule	Reject	Rule 1 allows the selection of all patients with a CKD diagnosis
2	IF (CKD_STAGE >= 3)	Next Rule	Reject	Rule 2 allows the selection of subset of patients with a CKD stage 3-5. This rule also ensures exclusion of unspecified CKD stage (e.g. coded stage 0 or missing value)
3	IF (HYPER = 1 AND PROTURIA = 1)	Select	Reject	Rule 3 allows the selection of subset of patients with a CKD stage 3-5 with both hypertension and proteinuria.
End of denominator rules				

CKD = Chronic Kidney Disease Diagnosis, CKD_STAGE = Staging of CKD disease, HYPER = Hypertension diagnosis, PROTURIA = Proteinuria event recording

Numerator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF (ARB = 1 OR ACE =1)	Next Rule	Reject	Rule 1 allows the selection of patients with at least one prescription of ARB or ACE inhibitor
2	IF (ARB_DATE OR ACE_DATE > RPED – 6 MONTHS)	Select	Reject	Rule 2 allows the selection of the subset of patients that are currently treated with ARB or ACE inhibitor (prescription within preceding six months)
End of numerator rules				

ARB = Prescription of ARB, ACE = Prescription of ACE, ARB_DATE = Date of ARB prescription, ACE_DATE = Date of ACE prescription, RPED = Reporting Period End Date

Disclaimer: This analysis was conducted using routinely collected data recorded according to the definitions, reporting frameworks, and treatment guidelines in effect during the study period; subsequent changes in these processes may limit direct comparability with more recent data