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Further Development of the Program on Preventive Health Check-Ups:

Screening for Chronic Kidney Disease

A rapid review of benefits, harms, and target populations

Final Report

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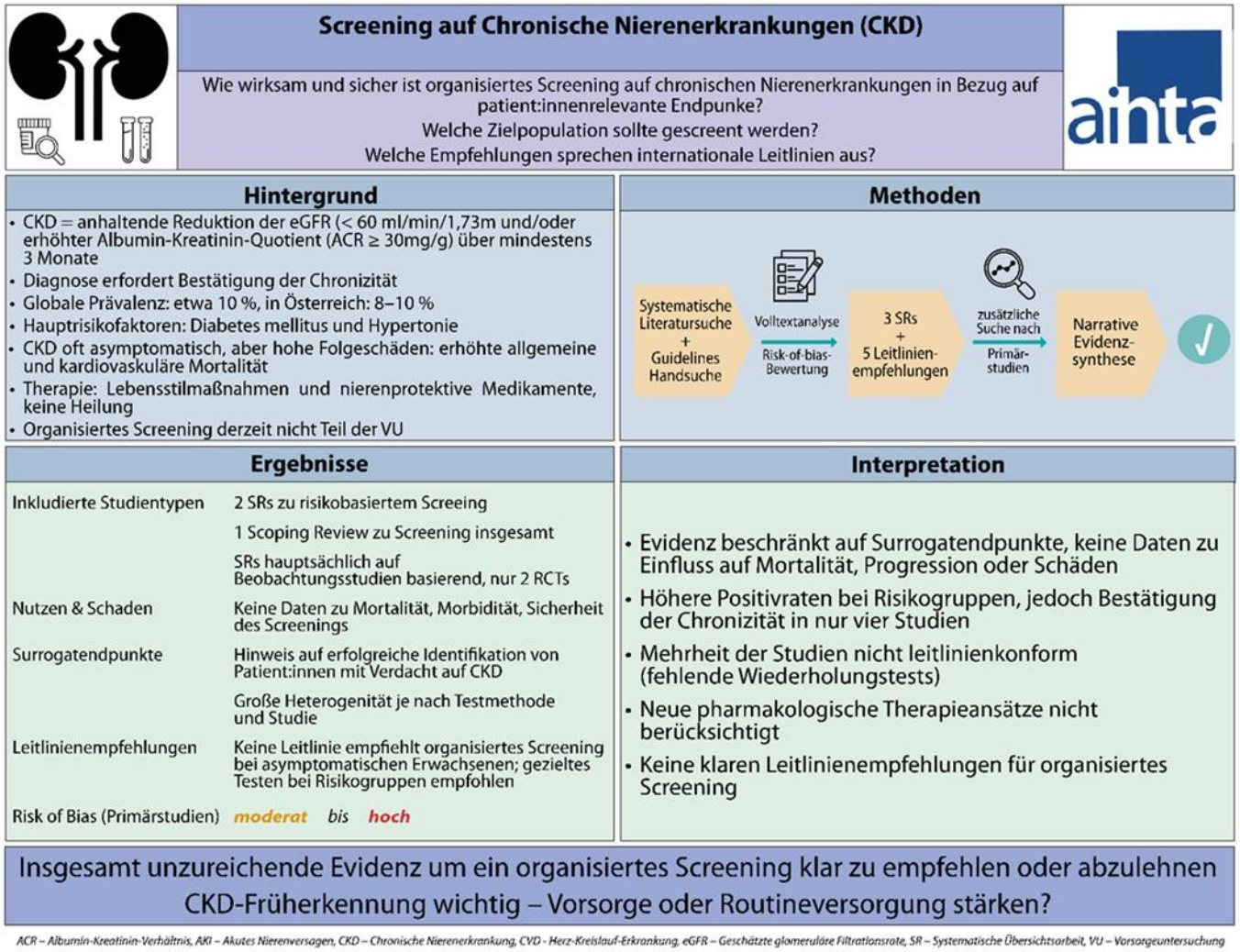
Abbreviations

ACROBAT-NRSI	A Cochrane Risk Of Bias Assessment Tool for Non Randomized Studies of Interventions
AKD	Acute Kidney Disease
AKI	Acute Kidney Injury
AWMF	Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften
CEA	Cost-Effectiveness Analysis
CTFPHC	Canadian Task Force on Preventive Health Care
CKD	Chronic Kidney Disease
CKD-EPI	Chronic Kidney Disease Epidemiology Collaboration
CVD	Cardiovascular Disease
eGFR	Estimated Glomerular Filtration Rate
ERA	European Renal Association
ESN	European Society of Nephrology
ESRD	End-Stage Renal Disease
DEGAM	Deutsche Gesellschaft für Allgemeinmedizin und Familienmedizin
gamma GT	Gamma Glutamyl Transferase
GLP-1	Glucagon-Like Peptide-1
ICER	Incremental Cost-Effectiveness Ratio
IQWIG	Institut für Qualität und Wirtschaftlichkeit im Gesundheitswesen
JBI	Joanna Briggs Institute
KDIGO	Kidney Disease: Improving Global Outcomes
MAU	Microalbuminuria
MDRD	Modification of Diet in Renal Disease
NICE	National Institute for Health and Care Excellence
NR	Not Recorded
nsMRA	Non-Steroidal Mineralocorticoid Receptor Antagonist
OR	Odds Ratio
PMCU	Preventive Medical Check-Up
POCT	Point-of-Care Testing
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
QALY	Quality-Adjusted Life Year
RAASi	Renin-Angiotensin-Aldosterone System Inhibitors
RCT	Randomized Controlled Trial
ROBIS	Risk of Bias in Systematic Reviews
SCr	Serum Creatinine
T2M	Type 2 Diabetes
UKNSC	UK National Screening Committee
USPSTF	US Preventive Services Task Force
(U)ACR	(Urinary) Albumin Creatinine Ratio
WHO	World Health Organization

1 Visualisation of results



2 Summary of results

2.1 Background and research question

2.1.1 Preventive health checks

Vorsorgeuntersuchung (VU) in Österreich: einmal jährlich, ab 18 Jahren, kostenlos

Primär- und Sekundärprävention

kardiovaskuläre Erkrankungen und Krebs im Fokus der VU

The preventive medical check-up program was introduced in Austria in 1974 [1]. In the national context, preventive medical check-ups (PMCU) aim to avoid health risk factors (primary prevention) and detect diseases early (secondary prevention). Particular emphasis is placed on cardiovascular diseases and cancer, which are among the most common causes of death in Austria [2]. To sustainably improve the health of the population, the program targets all individuals aged 18 and over whose primary residence is in Austria [2, 3]. The program is mainly carried out by general practitioners and specialists in internal medicine and is offered once a year, free of charge. In a two-step process, medical examinations are performed and laboratory parameters are collected, followed by a consultation to review and discuss the results. The basis of the annual health check consists of the following for all age groups and genders [4]:

Basisuntersuchungen:

Anamnese,

Untersuchungen von Blut und Harn,

körperliche Untersuchung,

Untersuchung auf Zahnfleischentzündung,

- Taking a detailed medical history: The aim of this is to recognise potential risk factors in advance by recording family history, medication and lifestyle habits, and to identify health risk factors.
- Blood sample and urine test: The blood test assesses blood sugar, cholesterol, triglycerides, gamma-GT, and includes screening for anaemia. The urine test checks for leukocytes, protein, glucose, nitrites, urobilinogen, and blood.
- Physical examination: A comprehensive physical examination is performed, including an assessment of the skin, neck (including the thyroid gland), heart, lymph nodes, lungs, abdomen, joints, spine, and peripheral cardiovascular system.
- Periodontal examination.
- Discussion of findings and counselling: Doctors will discuss the findings with the patients and inform them about their current state of health during a follow-up appointment once the laboratory tests have been completed.

Besprechung der Befunde und Beratung

zusätzliche Untersuchungen je nach Geschlecht und Alter

Depending on age and gender, further examinations are recommended, including a cervical smear, mammogram, prostate examination, and hearing and vision tests [4], which will not be discussed further here. People who attend the PMCU do so on average every three years [5].

steigende Inanspruchnahme der VU im Jahr 2023

In 2023, 17.5% of the Austrian population took advantage of a PMCU, representing a 14.9% increase compared to the previous year [6]. There was a gender-specific difference: women (18.3%) used the service more frequently than men (16.6%) [3].

Frauen nehmen die VU häufiger in Anspruch als Männer

Public expenditure on general preventive measures totalled €1,877 million in 2023, which corresponds to 4.64% of the annual public health expenditure [7]. The costs for the PMCU health screening amounted to approximately €201 million, which represents 10.71% of the total costs in health prevention [3].

The last update of the screening program took place in 2005 [8], and the Federation of Social Insurances is currently in the process of revising the included screening services. In 2023, the Austrian Court of Auditors (ACA) assessed the PMCUas a fundamentally effective tool for the early detection of diseases and identification of risk groups. However, criticism was expressed at the low participation rate and the inadequate quality of documentation, which prevents evidence-based management and further development of preventive measures [9]. The report also referred to a university study which showed that participants appreciated the PMCU for early detection and health maintenance, but criticised the lack of standardisation and the lack of individualised examinations [9].

letztes Update der VU vor 10 Jahren

Kritik an der niedrigen Teilnahmequote

zu wenig Standardisierung und individualisierte Untersuchungen

To further increase the participation rate, the social insurance system relies on improved communication measures, such as a targeted invitation system and risk group-specific screening programs [5].

verbesserte Kommunikations-Maßnahmen könnten die Inanspruchnahme weiter steigern

2.1.2 Chronic kidney disease (CKD)

According to the 2024 KDIGO Clinical Practice Guideline [10], chronic kidney disease (CKD) is defined as abnormalities in kidney structure or function that are present for more than three months and are associated with adverse health consequences. This includes either a reduction in glomerular filtration rate (GFR) to less than 60 mL/min/1.73 m^2, or the presence of markers of kidney damage, such as albuminuria, urinary sediment abnormalities, electrolyte imbalances due to tubular disorders, histological or structural abnormalities, or a history of kidney transplantation. While primary kidney disorders can lead to CKD, the vast majority of cases develop as a consequence of common chronic conditions - most notably Type 2 diabetes (T2M) and hypertension [11]. Epidemiological data indicate that about one-third of people with diabetes, 20% of those with hypertension, and half of those with heart failure also have CKD [12].

chronische Nierenerkrankung definiert als funktionelle und strukturelle Veränderungen der Niere, die länger als drei Monate andauern und mit schädlichen Gesundheitsfolgen assoziiert sind

oft als Folge anderer chronischer Erkrankungen

The main challenge of CKD lies in its insidious, yet progressive nature. Clinical symptoms usually appear only in advanced stages of kidney failure and are often non-specific, including fatigue, poor concentration, and sleep disturbances. In advanced stages, oedema, pruritus, nausea, and vomiting are common symptoms. Untreated CKD can lead to end-stage renal disease (ESRD), requiring renal replacement therapy (dialysis or transplantation) [11]. Chronic kidney disease is associated with a substantially increased risk of mortality, primarily due to its strong link with cardiovascular disease (CVD). Mortality risk increases even with moderate kidney impairment, long before end-stage disease. Cardiovascular events, such as heart attacks, are common in CKD patients, with the risk of dying from heart disease increased at least sixfold [12]. CKD also worsens the severity of many other conditions, including infections like pneumonia.

Symptome meist erst in fortgeschrittenen Stadien präsent und oft unspezifisch

kann unbehandelt zu Endstadium-Nierenerkrankung führen

starker Zusammenhang mit Herz-Kreislauf-Erkrankungen

These interactions highlight that CKD cannot be considered in isolation, as it significantly increases the risk of severe outcomes and mortality across a range of comorbidities, including diabetes, hypertension, obesity, liver and autoimmune diseases, cancer, and pregnancy-related complications [11, 12]. Importantly, CKD is a key component of cardiovascular-kidney-metabolic (CKM) syndrome, a disorder reflecting the interconnected risks among obesity, diabetes, CKD, and CVD - including heart failure, atrial fibrillation, coronary heart disease, stroke, and peripheral artery disease - affecting both individuals at risk for CVD and those with existing CVD [13].

CKD erhöht das Mortalitätsrisiko verschiedener Erkrankungen

wichtige Komponente des cardiovascular-kidney-metabolic (CKM) Syndroms

The 2017 Global Burden of Disease Study estimated a global CKD prevalence of 9.1% [14]. In Austria, CKD prevalence is not systematically recorded, but estimates range from 8.6% to 10.7% [12]. Unlike many other chronic diseases whose mortality rates have declined, CKD mortality continues to rise globally [15]. Between 1990 and 2017, CKD-related deaths increased by over 40%, making it the third fastest growing cause of death worldwide. In 2017, CKD directly caused 1.2 million deaths, with an additional 1.4 million cardiovascular deaths linked to impaired kidney function. Projections estimate CKD will become the fifth leading cause of death by 2040 [12, 15, 16].

globale Prävalenz 2017: 9,1%; in Österreich geschätzt 8,6% bis 10,7%

Mortalitätsraten steigend

CKD detection

According to KDIGO guidelines [10], assessment for CKD should include testing for estimated glomerular filtration rate (eGFR) and albumin-to-creatinine ratio (ACR), along with other markers of kidney damage as needed. CKD is suspected if eGFR is below 60 mL/min/1.73 m^2, ACR is ≥30 mg/g (≥3 mg/mmol), or other signs of kidney damage are present. Although serum creatinine (SCr) alone and dipstick urinalysis are sometimes used in practice, particulary in low-resource settings, KDIGO emphasises that SCr without eGFR calculation is insufficient for accurately assessing kidney function, and dipstick analysis is less sensitive than ACR, and therefore not recommended for diagnosis or staging [10]. The sensitivity and specificity of ACR and eGFR to detect CKD is high. eGFR, calculated using the CKD-EPI formula, has a mean sensitivity of 89% and a mean specificity of 88% for detecting kidney function below 60 ml/min/1.73 m^2. This means eGFR correctly identifies most patients with impaired kidney function while also accurately ruling out those without significant impairment. Measuring ACR (from the first morning urine) demonstrates even higher accuracy, with a sensitivity of 97% and specificity of 94% for a threshold of 3 mg/mmol [8]. To confirm chronicity and exclude acute kidney injury (AKI) or acute kidney disease (AKD), repeat testing is required after three months - or sooner if chronic features are evident. Further evaluation includes classification by eGFR and ACR, identification of the underlying cause, risk stratification, and initiation of appropriate treatment. If results after repeated testing are within normal range and no other markers of kidney damage are present, CKD is not diagnosed, and retesting should be individualised based on risk factors. Given that both eGFR and ACR can be transiently affected by non-renal factors - including infection, menstruation, exercise, muscle mass, dehydration, medications, and dietary protein intake - repeat testing is essential following incidental detection of abnormalities to avoid misclassification [14]. In the latest update from KDIGO, testing for cystatin C is emphasised in clinical situations when a creatinine based eGFR is less accurate and GFR affects clinical decision-making.

geschätzte glomeruläre Filtrationsrate *und* Albumin-Kreatinin-Quotient sollten zur Beurteilung der Nierenfunktion herangezogen werden

hohe Sensitivität und Spezifität von ACR und eGFR

CKD Diagnose erst nach Bestätigung von Chronizität durch wiederholtes Testen nach drei Monaten

eGFR und ACR können vorrübergehend beeinflusst werden

Testen auf Cystatin C in bestimmten Situationen empfohlen

CKD management and treatment

Treatment of CKD focuses on slowing disease progression and preserving kidney function, as no curative treatments currently exist. The KDIGO guideline emphasises holistic management of individuals with CKD, recognising the interrelatedness of risk factors for CKD development and progression including diabetes, obesity and CVD. Recommended disease management involves a comprehensive approach combining nonpharmacological strategies based on physical activity and dietary management with pharmaceutical interventions reflecting current evidence from high-quality RCTs [10, 17]. Updated practice points recommend targeting coexisting conditions such as hypertension, diabetes, and cardiovascular disease. Sodium-glucose cotransporter 2 inhibitors (SGLT2i) are now recommended for people with CKD, including patients both with and without T2M, regardless of albuminuria, due to strong evidence of reducing kidney failure, cardiovascular mortality, and heart failure. Renin-angiotensin-aldosterone system inhibitors (RAASi) remain recommended for blood pressure and proteinuria control while statins are recommended to reduce atherosclerotic cardiovascular risk. Recent evidence also supports finerenone – a non-steroidal mineralocorticoid receptor antagonist (nsMRA) for use in T2M with CKD and highlights kidney-protective effects of GLP-1 receptor agonists [17].

Fortschreiten der Erkrankung soll verlangsamt, die verbleibende Nierenfunktion erhalten werden

chronische Nierenerkrankung ist nicht heilbar

Behandlung soll auch Begleiterkrankungen berücksichtigen; Lifestyle-Interventionen sinnvoll

Einsatz unterschiedlicher Medikamente

Screening for CKD is currently not integrated into Austria's standard preventive medical check-ups, and diagnostic markers such as eGFR and albumin-creatinine ratio are not routinely measured [12].

Screening auf chronische Nierenerkrankung derzeit nicht in VU inkludiert

In 2019 an evidence review by the Donau University Krems [8] resulted in a weak recommendation, based on low-quality evidence, to screen adults over 40 with at least one risk factore using ACR ratio and serum creatinine/GFR. The objective of this rapid review is to provide an updated synthesis of direct evidence regarding risk-based and population-based screening strategies for CKD.

Review der Donau Universität Krems aus 2019

2.1.3 Questions to be answered in this rapid review

This Rapid Review aims to answer the following questions:

Forschungsfragen des Rapid Review

- (Q1) What was the benefit of CKD screening in recent systematic reviews, with respect to patient-relevant outcomes?
- (Q2) For which target populations was CKD screening found to be beneficial according to these reviews?
- (Q3) What are the current guideline recommendations regarding CKD screening?

Table 2-1: PICOs-table regarding research questions

Population	Adult patients >18 years without diagnosed CKD
Intervention	Screening for CKD, based on eGFR (SCr), eGFR(cyst) and Proteinuria/Albuminuria/ACR testing (POCT dipstick or urinalysis)
Control	No Screening/Standard of care
Outcomes	■ Clinical endpoints such as all-cause mortality, CKD-specific mortality, morbidity (e.g., improvement of kidney function/ progression to dialysis) ■ Percentage of positive screening tests ■ Percentage of confirmed CKD-diagnoses at follow-up ■ Harms from screening (misdiagnoses, psychological burden, unnecessary further investigations) ■ Percentage of medication initiation Not: cost-effectiveness, diagnostic accuracy
Study designs	Question 1 and 2: High-quality systematic reviews Question 3: Manual search for recent guidelines in GIN and TRIP databases, search for HTA reports in the INAHTA database and websites of HTA institutions
Geographical Area	Western countries with established healthcare systems (including Europe, USA, UK, Australia)
Language	German, English

2.1.4 Methods

systematische Literatursuche in zwei Datenbanken

To identify relevant publications for questions one and two, we conducted a systematic literature search on 7th of May 2025, in the following two databases:

- Ovid Medline
- The Cochrane Library

zusätzliche Suche nach RCTs zu bevölkerungsweitem Screening

Our initial search identified two systematic reviews on risk-based screening and one scoping review including both risk-based and population-based screening. Full text analysis showed that the scoping review did not fully align with our PICO scope, therefore we subsequently conducted an additional systematic search for primary studies focusing only on population-based screening in the same databases on the 25th of July 2025.

Literaturauswahl in Rayyan und Volltextanalyse durch zwei Wissenschaftlerinnen

The literature selection was carried out in Rayyan. Initially, 50% of abstracts were screened by two researchers (DG, JMF). Due to sufficiently high agreement regarding the selection for further analysis, the remaining 50% of abstracts were reviewed by one researcher (DG). The full-text analysis was carried out by one researcher (DG) and reviewed by a second (JMF).

drei Studien eingeschlossen und auf Biasrisiken bewertet

Three studies were selected for inclusion. Two reviewers (DG, JMF) independently assessed these studies for risk of bias using the Cochrane ROBIS tool. Of the three, two systematic reviews focused on risk-based CKD screening and one scoping review examined CKD screening more broadly. All three were included in the synthesis, having been judged to have low risk of bias.

The scoping review was only partially consistent with our predefined PICO criteria, as it specifically excluded studies reporting clinical outcomes. However, it was included in the synthesis due to its comprehensive overview of the global landscape of CKD screening and its relevance in describing several outcomes aligned with our PICO framework.

ein Scoping Review trotz nur teilweiser Übereinstimmung mit der PICO-Fragestellung eingeschlossen

To identify evidence on population-based screening directly assessing patient-relevant outcomes, we conducted an additional search focused on primary studies. In accordance with the evidence hierarchy from our methodological framework for rapid reviews, we limited the search for primary studies on the effectiveness of population-based CKD screening to randomized controlled trials. During abstract screening, we further restricted inclusion to studies reporting patient-relevant outcomes such as mortality, morbidity and safety, focusing on results that directly inform the balance of benefits and harms of screening. No RCTS meeting our eligibility criteria were identified. An additional hand search also did not identify any further studies for inclusion.

zusätzliche Suche nach RCTs zu bevölkerungsweitem Screening

Einschränkung auf Studien mit patient:innen-relevanten Endpunkten

Additionally, we performed a search for ongoing clinical studies on 5th of July 2025 on the following study register:

Suche nach laufenden Studien

- ClinicalTrials.gov

For research question three, a search on the GIN (Guidelines International) and TRIP (Turning Research into Practice) databases identified no relevant publications, so we performed a manual search for guidelines on databases and websites of the following HTA institutions and international professional societies, and extracted relevant information, if available:

Suche nach Leitlinien in Datenbanken und Handsuche auf Websites verschiedener Institutionen

- Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften (AWMF)
- Institut für Qualität und Wirtschaftlichkeit im Gesundheitswesen (IQWIG)
- UK National Screening Committee (UKNSC)
- US Preventative Services Task Force (USPSTF)
- National Institute of Healthcare Excellence (NICE)
- Canadian Task Force on Preventive Health Care (CTFPHC)
- Kidney Disease Improving Outcomes (KDIGO)
- European Society of Nephrology (ESN)
- European Renal Association (ERA)

The transferability of results from international studies or recommendations from international guidelines to the Austrian context and any implications for practice were assessed by the authors and the external expert and described by the authors in the discussion.

Einschätzung der Übertragbarkeit der Ergebnisse auf österreichischen Kontext durch externen Experten

2.2 Results

Results from two systematic reviews conducted in Australia (published in 2018 and 2025, respectively) [18, 19] and one multinational scoping review published in 2022 [20] were included in evidence synthesis (see Table 3-1).

2 Systematische Reviews, 1 Scoping Review inkludiert

We did not perform a formal comparison of the studies included in the respective reviews, therefore it is important to note that some primary studies may have appeared in more than one review.

Reviews inkludierten Studien verschiedener Designs

insgesamt ca. 4 Millionen Teilnehmer:innen eingeschlossen

The systematic review by Gheewala et al. [18] synthesized data from nine observational studies (six prospective, three cross-sectional) with a total of 164,821 individuals. The other systematic review by Korsa et al. [19] included 22 observational studies (12 prospective, 10 cross-sectional) and two cluster-randomized controlled trials, encompassing approximately 2 million participants. The scoping review by Okpechi et al. [20] synthesized evidence from 270 studies, evaluating 290 CKD screening programs, including 227 cross-sectional studies, nine prospective cohort studies, and 34 database reviews, with a combined sample size of approximately 3.72 million individuals.

Systematische Reviews zu risikobasiertem Screening, Scoping Review auch zu bevölkerungsweitem Screening

The two systematic reviews focused on risk factor-based CKD screening conducted in any community-based setting by any healthcare professional, whereas the scoping review included both risk-based and population-level screening or early identification programs. Gheewala and Korsa both included similar core risk factors: diabetes, CVD and family history of kidney disease. Korsa et al. included additional factors like obesity, prior AKI , age over 60, smoking or indigenous population status. However, neither of the risk based reviews nor the scoping review included details on how risk assessments were conducted, leaving the methods of identifying high-risk individuals unclear. In all studies, the comparator was either no screening or standard care, and participants were adults without a prior confirmed diagnosis of CKD.

unterschiedliche Diagnostik von CKD:

Messung der Nierenfunktion und/oder Marker für Nierenschäden

Across the included studies, the methods used to diagnose CKD varied. Some studies relied solely on measures of kidney function, while others incorporated markers of kidney damage.

unterschiedliche Formeln zur Errechnung der eGFR:

CKD-EPI formula, MDRD formula, Cockcroft-Gault formula

In the review by Gheewala et al. [18], eight studies (89%) assessed both kidney function and kidney damage, whereas one study evaluated kidney damage alone. Specifically: five studies (56%) used a combination of eGFR and ACR, consistent with guideline recommendations; two (22%) studies combined eGFR with dipstick urinalysis, one (11%) study combined SCr with dipstick urinalysis, and one study (11%) used dipstick urinalysis for proteinuria as the sole diagnostic method. For the calculation of eGFR, three studies (43%) used the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formula, while four studies (57%) employed the Modification of Diet in Renal Disease (MDRD) formula. In the more recent review by Korsa et al. [19], 21 of 24 studies (88%) incorporated both kidney function and damage parameters, while three assessed kidney function only. Thirteen studies (54%) used the guideline-recommended combination of eGFR and ACR, one of which also included cystatin C. Five studies (21%) used eGFR with dipstick urinalysis for proteinuria or microalbuminuria (MAU); among these, one also measured SCr. One study (4%) assessed dipstick urinalysis and SCr, while another (4%) combined eGFR with dipstick urinalysis. Three studies (13%) evaluated eGFR alone, and one study (4%) applied a comprehensive panel including eGFR, ACR, dipstick urinalysis, and SCr. For the estimation of eGFR, CKD-EPI formula was used in 12 studies (50%), the MDRD formula in seven studies (29%), the Cockcroft-Gault formula in one study (4%), and a combined creatinine-cystatin C-based eGFR in one study (4%).

In the global scoping review on CKD screening [20], 43 studies (14.8%) assessed kidney function alone using SCr and/or eGFR, while 40 studies (13.8%) evaluated kidney damage alone using either dipstick urinalysis or urine ACR; the majority - 207 studies (71.4%) - used a combination of kidney function and damage markers, typically SCr or eGFR in conjunction with dipstick urinalysis or uACR, and a small subset (n = 3; 1%) additionally included cystatin C in their screening protocols. The most used method for estimating eGFR was the MDRD formula (n = 150; 51.7%), followed by the CKD-EPI formula (n = 85; 29.3%) and the Cockcroft–Gault formula (n = 30; 10.3%). A small number of studies used other methods, such as a Japanese-specific equation (n = 3; 1%), while 22 studies (7.6%) did not report the method used.

Scoping review: Großteil der Studien verwendet Kombination aus Nierenfunktions- und Schadensmarkern

hauptsächlich MDRD Formel angewendet

Repeat testing for chronicity was performed in four studies in both risk-based reviews, respectively. In the global scoping review, repeat testing was reported in 20% of included studies overall, with a higher frequency in risk-based screening programs (24.3%) compared to population-based approaches (17.5%).

Testung auf Chronizität in nur 8 Studien in SRs bzw. in 20% der Studien im Scoping Review

Follow-up periods ranged from 0.5 to 3 months in Gheewala et al. [18], and from 0.5 to 15 months in Korsa et al. [19]. Okpechi et al. [20] reported a range of follow-up durations across included studies: 12.4% of studies had follow-up periods of up to 3 months, 25.9% between 3 and 12 months, and 29% reported follow-up beyond 12 months. 32.8% of the studies included did not report a follow-up time.

Follow-up von 0,5 bis 15 Monaten in SRs

Scoping Review: 29% der Studien mit Follow-up über 12 Monate

While the scoping review did not undertake a formal risk of bias assessment, both systematic reviews evaluated study quality using established tools. Gheewala et al. [18] applied the Cochrane Risk of Bias Assessment Tool for Non-Randomized Studies of Interventions (ACROBAT-NRSI), rating eight studies as moderate risk of bias and one study as high risk due to substantial missing data. Korsa et al. [19] assessed the risk of bias using the Joanna Briggs Institute tool (JBI), judging 21 of the studies included to be of moderate to high quality. Both cluster-randomized controlled trials included in Korsa et al. [19] were rated as high quality.

Bewertung des Biasrisikos mit etablierten Tools in SRs

inkludierte Studien mit großteils moderater bis hoher Qualität

2.2.1 Effectiveness

Neither the systematic reviews on risk-based screening nor the scoping review reported outcomes related to clinical endpoints, including all-cause mortality, CKD-specific mortality, morbidity measures (e.g., improvement in kidney function or progression to end-stage renal disease), or potential harms such as overdiagnosis and psychological burden. Instead, all reviews focused on surrogate outcomes, including the proportion of positive screening tests and confirmed CKD diagnoses upon follow-up.

keine patient:innenrelevanten Endpunkte

nur Surrogatendpunkte berichtet

Percentage of positive Screening results

Gheewala et al. [18] reported that evidence of kidney damage was identified in 11.4% to 60.3% of participants using dipstick urinalysis, and in 8% to 35% based on ACR. Reduced kidney function was detected in 12% of participants measuring SCr, and in 7% to 26.1% when eGFR was applied. Combined positive screening results were reported in four follow-up studies, ranging from 20.4% to 56%.

Nachweis von Nierenschäden in bis zu 60,3% bei Einsatz von Teststreifen, bis zu 35% basierend auf ACR

Korsa et al. [19] reported kidney damage in 5.3% to 35% of participants when measured by ACR and 7.25% to 60% when assessed by dipstick urinalysis. A decrease in kidney function was found in 2.6% to 43.9% of participants when assessed by eGFR and in 5.5% to 12.8% when assessed by SCr. Combined abnormal test results were reported in 14 studies and ranged from 2.9% to 56%.

reduzierte Nierenfunktion in bis zu 43,9% (eGFR) bzw. 12,8% (SCr)

kombinierte positive Tests in bis zu 56%

The scoping review [20] reported a global prevalence of CKD (defined by eGFR < 60ml/m2) from 0% to 76.5%, with a mean of 8.8% (range: 4.3-16.1). Population-based studies (n=131) reported a lower prevalence range of 0-30.3% with a mean of 8% (range: 3.0-11.4), whilst the risk-based studies reported a higher proportion of 0%-76.5 % with a mean of 14.8% (range 6.4-25.5). Six studies focusing on patients with hypertension reported a mean prevalence of CKD of 28.3% (range 24.9 to 44.5) and 22 studies including patients with diabetes mellitus reported a mean prevalence of 21.1% (range:15.5 to 25.5). The global prevalence of albuminuria reported ranged from 0.2% to 57%, with a mean of 12.5% (range: 6.7–17.2). Among population-based studies (n=113), the prevalence ranged from 0.2% to 46.3%, with a mean of 11.2% (range: 6.2–17.2). Risk-based studies (n=50) reported a higher prevalence, ranging from 1.1% to 57%, with a mean of 17.9% (range: 10.9–33.4). Three studies focusing on individuals with hypertension reported a mean prevalence of 11.8% (range: 9.3–13.4), while fifteen studies including participants with diabetes mellitus reported a substantially higher mean prevalence of 32.7% (range: 19.1–39.8).

Scoping Review: Durchschnittliche Prävalenz CKD (eGFR): 8,8%, Albuminurie: 12,5%

höhere Prävalenz in risikobasierten Studien

höchste Prävalenz bei Patient:innen mit Bluthochdruck und Diabetes Mellitus

Repeat testing for chronicity

Chronicity - and thus a definitive CKD diagnosis according to KDIGO guidelines - was reported in only a few studies across the risk-based reviews. In Gheewala et al. [18], two studies reported CKD diagnoses in 20.5% and 17.1% of participants, respectively, while a third study reported a 1% prevalence, though the diagnostic tests used were not specified. In Korsa et al. [19], four studies reported CKD diagnoses ranging from 4.4% to 17.1% of screened participants. One study utilizing electronic health records observed a statistically significant increase in CKD screening and diagnosis rates, rising from 4.5% at baseline to 5.8%, with an odds ratio of 1.18 (95% CI: 1.09–1.28). Okpechi et al. [20] described that 20% of all included studies performed repeat testing, with 24.3% of risk-based and 17.5% of population-based studies, respectively. However, the percentage of identified CKD cases was not reported.

nur wenige Studien berichten Chronizität

bestätigte Diagnosen in bis zu 20,5% (n=3) bzw. bis zu 17,1% (n=4)

Scoping Review: wiederholte Testungen in 20% der Studien, bestätigte Diagnosen nicht berichtet

2.2.3 Safety and harms

None of the included reviews reported harms related to screening for CKD.

keine Ergebnisse zu Schäden oder unerwünschten Folgen

2.2.4 Initiation of medication or lifestyle modification

None of the systematic reviews on risk-based screening reported outcomes related to disease management. In the scoping review by Okpechi et al. [20], initiation of any pharmacotherapy was reported in 2.8% of patients overall, with a higher proportion in targeted interventions (4.7%) compared to population-based interventions (1.6%). Similarly, lifestyle measures were initiated in 6.9% of patients, with 7.5% in targeted versus 6.6% in population-based interventions.

Scoping Review: Einleitung medikamentöser Therapie in 2,8%

Lebensstil-Maßnahmen in 6,9%

2.3 Guideline recommendations

Five guidelines on CKD identification and screening were identified, one from Germany [21], two from the United Kingdom [22, 23], one from the United States of America [24] and one international guideline document [10]. Details can be found in **Fehler! Verweisquelle konnte nicht gefunden werden.** in t he Appendix.

5 relevante und rezente Leitlinien identifiziert

The updated S3 guideline for the primary care management of patients with CKD by DEGAM [21], drawing on KDIGO [10], NICE [23], and other sources, explicitly recommends against screening asymptomatic adults without risk factors. Instead, it promotes risk-based evaluation, such as annual eGFR testing in patients with diabetes, and kidney function assessment in those with newly diagnosed hypertension, exposure to nephrotoxic medications, or a family history of hereditary kidney disease. Similarly, while not explicitly recommending a formal screening program, the NICE guideline [23] advises testing using eGFR and ACR in individuals with specific risk factors - including diabetes, cardiovascular disease, a history of acute kidney injury, structural renal tract abnormalities, and hereditary kidney disease.

deutsche S3 Leitlinie gegen das Screening asymptomatischer Personen ohne Risikofaktoren

risikobasierte Evaluation für Risikopatient:innen von DEGAM und NICE empfohlen

The USPSTF [24] and UKNSC [22] both conclude that there is insufficient evidence to support routine population-based or risk-based screening for CKD in asymptomatic adults; on the UKNSC website however, there is an explicit recommendation against screening. The USPSTF explicitly excludes testing for and monitoring of CKD in the context of chronic disease management (eg. patients with diabetes or hypertension) from its recommendation. An update is currently in progress.

USPSTF: unzureichende Evidenz für Empfehlung

UKNSC: Empfehlung gegen Screening auf Website

The KDIGO guidelines [10] also do not formulate a specific screening recommendation, citing ongoing debate and variability in healthcare resources and policy. However, they strongly support testing at-risk populations using both eGFR and albuminuria measures.

KDIGO: keine explizite Empfehlung für oder gegen Screening, aber Testung von Risikogruppen empfohlen

Table 2-2: Overview of guideline recommendations

Guideline	Screening recommendation:		Grade of recommendation	Level of evidence
	Population-based	Risk-based		
DEGAM, 2024 [21]	×	(✓)	B/A-B[1]	Ib/II[2]
KDIGO, 2024 [10]	-	(✓)	n/a	n/a
NICE, 2021 [23]	-	(✓)	n/a	n/a
USPSTF, 2014 [24][3]	~	-[4]	I-insufficient evidence	n/a
UKNSC, 2010[5] [22]	×	×	n/a	n/a

Explanation of symbols: (✓) – testing recommended, no recommendation for or against organised screening; × - organised screening not recommended; ~ - no recommendation for or against organised screening, - - no specific statement, n/a – not available

2.4 Ongoing studies

A search on the ClinicalTrials.gov database yielded 59 results; however, we did not identify any ongoing studies that met our PICO criteria evaluating risk-based or population-based screening for chronic kidney disease (CKD).

keine laufenden Studien identifiziert

2.5 Discussion

CKD is a pressing global public health issue, affecting an estimated 10% of the world's population [14]. Based on the World Health Organization (WHO) screening criteria, CKD meets several key requirements for consideration as a target for screening: it is highly prevalent, has a long asymptomatic phase, is associated with significant morbidity and mortality, and can be detected using simple, low-cost tests with effective interventions available to slow disease progression and reduce complications [25]. In addition to strict blood pressure control and the established role of RAAS inhibitors as kidney- and cardioprotective agents in the treatment of CKD, recent trials have demonstrated that SGLT2 inhibitors reduce cardiovascular and renal events in patients with and without T2M, irrespective of albuminuria level. Emerging evidence also supports the kidney-protective effects of finerenone and

10% der Weltbevölkerung von chronischer Nierenerkrankung betroffen

mehrere WHO-Screeningkriterien erfüllt,

[1] A: hohe Empfehlungsstärke (strong recommendation); B: mittlere Empfehlungsstärke (moderate recommendation strength)

[2] Ib: Evidenznachweis durch einzelne randomisiert kontrollierte Studien (evidence from individual randomized controlled trials); II: Evidenznachweis durch Kohortenstudien (evidence from cohort studies)

[3] Recommendation outdated; Update currently in progress

[4] The USPSTF defines the population under consideration as: "This recommendation applies to asymptomatic adults without diagnosed CKD. Testing for and monitoring CKD for the purpose of chronic disease management (including monitoring patients with diabetes or hypertension) are not covered by this recommendation."

[5] Despite no clear recommendation in the guideline document, on the UKNSC website (Kidney disease - UK National Screening Committee (UK NSC) - GOV.UK), there is a clear recommendation against screening for both population based and risk-based screening.

suggests the potential benefit of GLP-1 receptor agonists in CKD patients with T2M [10, 17].

However, several limitations complicate the implementation of a broad screening strategy [26]. While validated risk equations such as the KFRE represent a major advance in stratifying prognosis for individuals with established CKD, they do not address the fundamental challenges of broad screening strategies. A significant proportion of people with early-stage CKD will never progress to kidney failure, and identifying them through organised screening risks overdiagnosis, unnecessary interventions, psychological burden, and substantial healthcare costs. Current evidence therefore supports targeted testing in clearly defined at-risk groups (e.g. diabetes, hypertension, cardiovascular disease) rather than population-wide screening, with risk equations serving as valuable tools for individualised management once CKD is diagnosed. Effective screening tests are available but can be influenced by transient factors [10], necessitating confirmation of chronicity over time and thus adding complexity to screening protocols. Furthermore, CKD's complex aetiology, often intertwined with comorbidities like diabetes and hypertension, means that screening programs require integration within broader chronic disease management strategies.

Limitationenin Bezug auf die Einführung eines organisierten Screenings

Risiko von Überdiagnosen, Überbehandlungen, psychologischer Belastung und erheblicher Kosten

Integration in umfassendere Strategien notwendig

The two systematic reviews on risk-based screening included in this rapid review report a wide range of positive test results [18, 19]. Kidney damage, when assessed by dipstick urinalysis, was detected in 5.3%- 35% of participants across the included studies. Testing with ACR yielded a higher proportion of positive results, ranging from 7.25%-60%. Kidney function impairment was identified in 5.5%- 12.8% of participants when tested with SCr alone, and in 2.6% to 43.9% of participants when applying eGFR. The scoping review on global CKD screening [20] reported an overall prevalence of CKD based solely on eGFR ranging from none to 76.5%, with a higher mean prevalence in risk-based studies (14.6%) compared to population-based studies (8%). Based on albuminuria testing, the overall prevalence of kidney damage ranged from 0.2%-57%, with a higher mean prevalence in risk-based studies (17.9%) compared to population-based studies (11.2%). These outcomes align with the design of risk-based screening, which targets individuals with a higher baseline likelihood of CKD. Whilst this approach appears more efficient in detecting cases, confirming chronicity - and thus a definite CKD diagnosis according to KDIGO guidelines – was reported only in a few studies, with confirmed CKD cases ranging from 1% to 20.5%, limiting the interpretability of the potential downstream benefits of a targeted approach.

breites Spektrum an positiven Testergebnissen in risikobasierten Studien

höhere Prävalenz in risikobasierten als in bevölkerungsbasierten Studien

höhere Wahrscheinlichkeit einer chronischen Nierenerkrankung bei Personen mit Risikofaktoren

Nachweis der Chronizität in nur wenigen Studien, potenzielle Vorteile des gezielten Ansatzes schwer einzuschätzen

The findings synthesised from the identified literature highlight a significant limitation in the current evidence supporting CKD screening: despite sufficient evidence supporting the diagnostic efficiency of both population based and risk-based strategies, there is a marked absence of data on patient-relevant clinical outcomes. None of the included studies reported effects on mortality, cardiovascular morbidity, or progression to end-stage renal disease – outcomes essential to assessing the true clinical effectiveness of screening interventions.

keine Ergebnisse zu patient:innenrelevanten Endpunkten wie Mortalität oder Morbidität – Einschätzung der Effektivität nicht möglich

All included reviews reported considerable heterogeneity in screening methods, including variation in test types, CKD definitions and cutoffs, factors that likely contribute to the large discrepancies in reported prevalence rates. Importantly, most studies relied on single, one-time measurements of kidney markers without repeat testing to confirm chronicity, as recommended by the KDIGO guidelines [10]. This raises concerns about overdiagnosis and the accuracy of reported CKD prevalence. Furthermore, validated risk assessment tools like QKidney were rarely used in risk-based screening approaches. These limitations highlight the need for well-designed prospective studies and randomised trials that evaluate not only detection rates, but also long-term health outcomes and potential harms.

Screening-Methoden sehr heterogen, mögliche Erklärung für variierende Prävalenzen

kaum wiederholte Testungen, Instrumente zur Risikobewertung kaum eingesetzt

While no clinical trials have yet demonstrated that CKD screening directly improves health outcomes, recent economic analyses suggest it may be cost-effective. A recent cost-effectiveness analysis (CEA) by Cusick et al. [27] found that based on modelled assumptions on disease progression, one-time CKD screening at age 55 increased life expectancy from 17.29 to 17.45 years, reduced the incidence of kidney failure by 0.29 percentage points, and yielded an ICER (incremental cost effectiveness ratio) of $86,300/QALY (quality adjusted life year) gained. Screening individuals aged 35 to 75 was projected to prevent dialysis or transplant in 398,000 people. Rokhman et. al's [28] review on economic evaluations of screening programs for CKD supports risk-based screening in individuals with diabetes or hypertension, while findings for general population screenings vary depending largely on the prevalence and screening costs. Both Cusick and Rokhman [27, 28] utilised Markov models to simulate disease progression and long-term outcomes, assuming uniform health state transitions, which may not reflect real-world variability in CKD prevalence, progression, comorbidities, or treatment effect and adherence, and assessed screening from a healthcare payer perspective. Cusick's model was based on a single randomized control trial and did not include the benefits of SGLT2 inhibitors on cardiovascular outcomes, the societal perspective or implementation factors [27]. Rokhman et al. noted that many models also excluded downstream healthcare costs and implementation factors and often lacked external validation or comprehensive sensitivity analyses [28]. These limitations reduce the certainty and generalizability of the cost-effectiveness estimates, especially for informing broad population-level screening policies. Importantly,their applicability to the Austrian context is constrained, because healthcare costs and reimbursement structures differ, and no formal ICER thresholds are applied.

rezente Kosten-Nutzen-Analyse zeigt mögliche Kosteneffektivität von organisiertem Screening, basiert aber auf nur einer Studie und berücksichtigt nicht alle wichtigen Faktoren

ein Review ökonomischer Bewertungen spricht für risikobasiertes Screening, während Ergebnisse für bevölkerungsbasiertes Screening variieren

Folgekosten oft nicht berücksichtigt

Generalisierbarkeit eingeschränkt

Our review of current guidelines on CKD screening demonstrates that there is strong agreement to not recommend organized, systematic screening in asymptomatic adults. We did not identify any guidelines that specifically recommend organized screening programs, whether population-based or risk-based. Some guidelines explicitly advise against population wide screening [21, 22], other remain neutral stating insufficient evidence [10, 24]. However, all guidelines strongly support targeted assessment for CKD in individuals at risk, including those with diabetes, cardiovascular disease, hypertension, AKI or a family history of kidney disease, without advocating for a structured or organised screening program. Despite clear guideline recommendations, adherence to such recommendations remains suboptimal with ACR testing performed less than eGFR testing, compromising the success of even risk-based screening approaches [29].

organisiertes Screening asymptomatischer Personen nicht empfohlen

Hinweis auf fehlende Evidenz

zielgerichtetes Testen von Risikogruppen wird empfohlen

Limited clinician awareness of CKD and its management is universally identified as a key barrier to care [30] and needs to be urgently addressed to build the foundation for any successful identification program.

Bewusstsein der Ärzt:innen muss gestärkt werden

While the findings from the included systematic reviews [18-20] offer insights into the potential and feasibility of detecting patients with kidney impairment, the benefits and harms of organised screening for CKD are not clear, and direct applicability to the Austrian context requires nuanced consideration. Austria's PMCU setting offers a well-established preventive healthcare program delivered through primary care physicians and internal medicine specialists, mirroring the primary care and outpatient environments examined in the reviews. This supports the practicality of implementation. Unlike studies conducted in pharmacies or lower-resource settings, Austria benefits from a robust healthcare infrastructure, experienced clinicians, and comprehensive electronic health records, which could facilitate systematic screening and follow-up processes.

Nutzen und Schaden von organisiertem Screening unklar

Österreich hat gut etablierte Gesundheitsvorsorge, Voraussetzungen für organisiertes Screening wären gegeben

Currently, the PMCU primarily incorporates age- and gender-based considerations for screening, without systematic integration of specific and individual risk factors such as hypertension, diabetes, or cardiovascular disease, and integration of risk-based CKD screening would require validated risk stratification tools and mechanisms for follow-up testing to confirm chronicity - an essential component of CKD diagnosis.

validierte Tools zur Risikostratifizierung und Follow-up Tests zum Nachweis der Chronizität nötig

One key limitation in the current evidence base, as also noted in the included reviews, is the lack of robust data on the effect of screening programs on hard clinical endpoints such as progression to end-stage kidney disease, cardiovascular events, or mortality, and the absence of any data on potential harms such as overdiagnosis or potential psychosocial effects, which are critical for understanding the full implications of screening and diagnosis.

fehlende Daten zu Wirksamkeit und Sicherheit

A further limitation exists in the fact that to date, none of the studies evaluating the efficacy or safety of CKD screening incorporated the use of recently available pharmacological treatments, despite robust evidence that these therapies can substantially reduce CKD progression and associated cardiovascular complications.

verfügbare Therapien reduzieren das Fortschreiten der CKD und kardiovaskuläre Komplikationen

Most individuals suffering from comorbidities listed as risk factors for CKD are likely already under the care of general practitioners. Case-finding in this setting may offer a pragmatic, cost-effective, and patient-centered strategy for CKD detection. Considering that only 17% of adults took part in the free preventive medical check-up in Austria in 2023, organised screening within the current PMCU setting is unlikely to yield a substantial number of previously undiagnosed CKD cases. By leveraging existing healthcare contacts, guideline adherent CKD assessment could be integrated into existing care pathways without the need for additional screening infrastructure. Increasing awareness of primary care physicians as well as patients would be essential to ensure guideline-adherent risk stratification and testing.

richtlinienbasierte Diagnostik in Routineversorgung sollte gestärkt werden

Sensibilisierung von Allgemeinmediziner:innen und Patient:innen sinnvoll

This rapid review is subject to several limitations. The systematic search was restricted to systematic reviews published in the past five years and in English or German, potentially omitting relevant evidence. The search on primary studies assessing population-based CKD screening was restricted to RCTS and studies reporting clinical outcomes. However, it is unlikely that relevant evidence was missed, as many recent publications highlight a lack of robust evidence and well conducted large trials to support decision making [10, 29]. We did not assess overlap of primary studies, and no risk of bias assessment

Limitationen

was conducted for primary studies within the included reviews. Additionally, the referenced guidelines, although issued by leading institutions and professional associations, were not qualitatively appraised, which limits the assessment of their methodological rigor.

2.6 Conclusion

möglicher Nutzen bei der Identifikation von Nierenerkrankungen, insbesondere durch risikobasiertes Screening

keine Daten zu patient:innenrelevanten Endpunkten

fehlende Langzeitdaten, inkonsistente Diagnosemethoden, keine Bestätigung der Chronizität

wenig Daten zu bestätigten Diagnosen

Leitlinien empfehlen risikobasiertes Testen

unzureichende Evidenz für oder gegen eine Empfehlung zu organisiertem Screening

Stärkung richtlinienbasierter Diagnostik in Routineversorgung sinnvoll

Evidence from two systematic reviews and a scoping review suggests the potential to identify CKD in community care settings, particularly among individuals with risk factors such as diabetes or hypertension. Positive effects were observed in detection rates and identification of kidney function impairment and damage; however, findings were limited to surrogate outcomes, with no data on mortality, ESRD progression, or other patient-relevant endpoints. No studies incorporating recent developments in CKD treatment in a screening setting could be identified. There was no evidence available regarding any harms of CKD screening, especially regarding potential overdiagnosis or psychological burden.

Key limitations included lack of long-term follow-up data, inconsistent diagnostic criteria, and limited repeat testing to confirm chronicity. Most studies did not verify chronicity, raising concerns about potential overestimation of CKD prevalence and the clinical significance of detected cases. While risk-based approaches identified a higher prevalence of kidney damage and function impairment, definite conclusions remain limited since confirmed CKD diagnosis was only reported in a small number of risk-based studies and no data on confirmed CKD diagnosis were identified in population-based studies.

Current guidelines support targeted testing in high-risk groups, but none recommend routine screening in asymptomatic adults

Overall, the current evidence base remains insufficient to draw conclusions regarding the clinical benefits and harms of CKD screening, limiting a clear recommendation for or against organised screening in a risk-based or general population.

In the Austrian context, the preventive medical check-up program may provide a suitable platform for structured, risk-based screening. At present, the program is offered universally, with most examinations and tests available to all adults and some additional tests provided depending on age or biological sex. Transitioning to a targeted approach for CKD would require structural adaptions, such as integrating risk stratification tools into routine data collection and the development of suitable follow-up protocols. Challenges may arise with regards to the feasibility of implementation within a system that is desigened around uniform criteria. Nonetheless, considerable uncertainty persists regarding the potential impact of organised screening on clinical outcomes and population health. Strengthening adherence to guideline-based testing practices in routine care could improve early detection of CKD in a substantial proprtion of at-risk patients, without the need for formal screening programs.

Building on the 2019 weak recommendation for a risk-based screening for CKD from the University of Krems [8], we suggest that any further review be embedded within a comprehensive, participatory, multi-criteria decision-making process involving patients, clinicians across primary and specialist care, public health and health economics experts, payers, policymakers, and professional societies. Such an approach would ensure that diverse perspectives are considered and that indirect evidence - including advances in pharmacotherapy, implementation challenges, and context-specific economic evaluations - is systematically assessed to inform an efficient strategy for CKD detection in Austria.

weitere Reviews sollten Teil eines umfassenden, partizipativen Entscheidungsprozesses sein

3 Appendix

3.1 Flow chart of study selection: search for systematic reviews

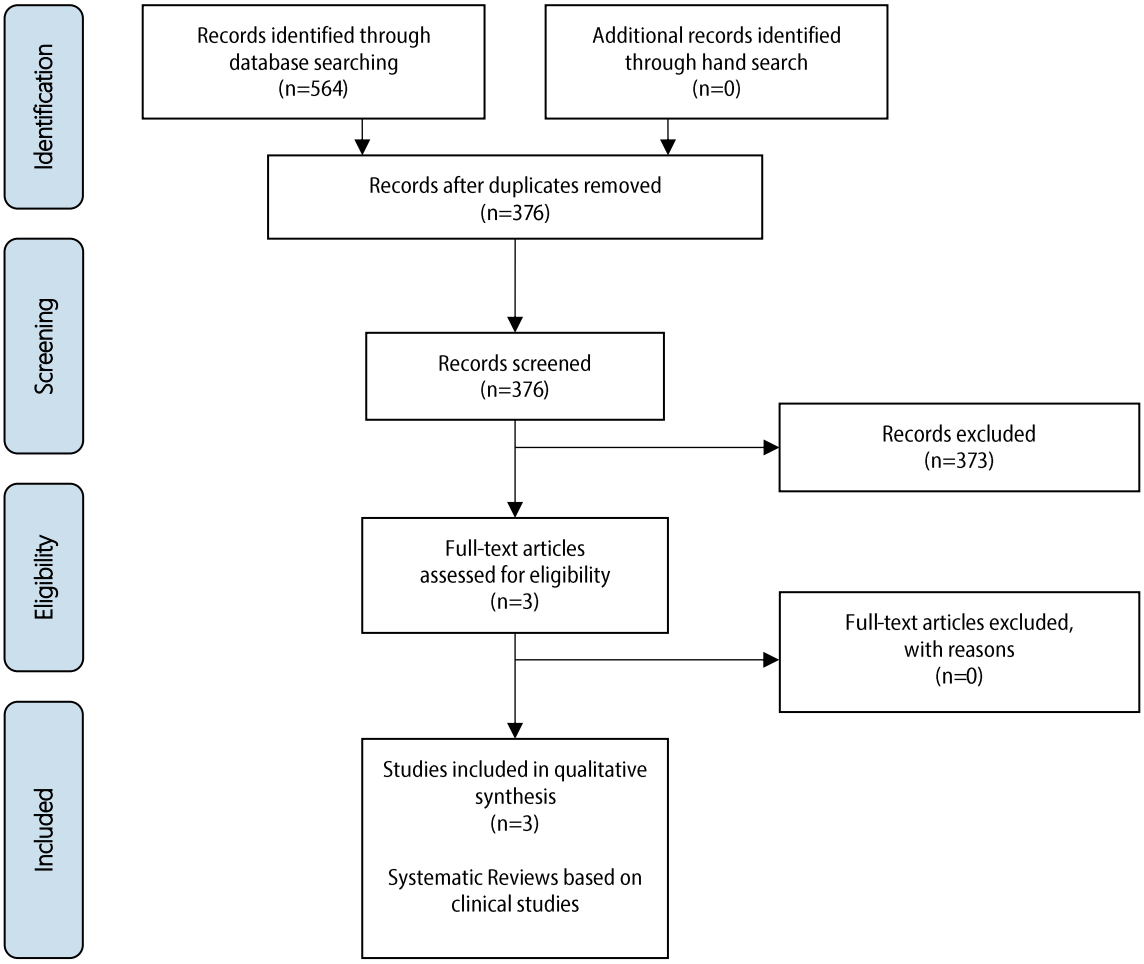


Figure 3-1: Flow chart of study selection (PRISMA Flow Diagramm): Systematic Reviews on CKD screening

3.2 Flow chart of study selection: additional search for RCTs on population-based screening

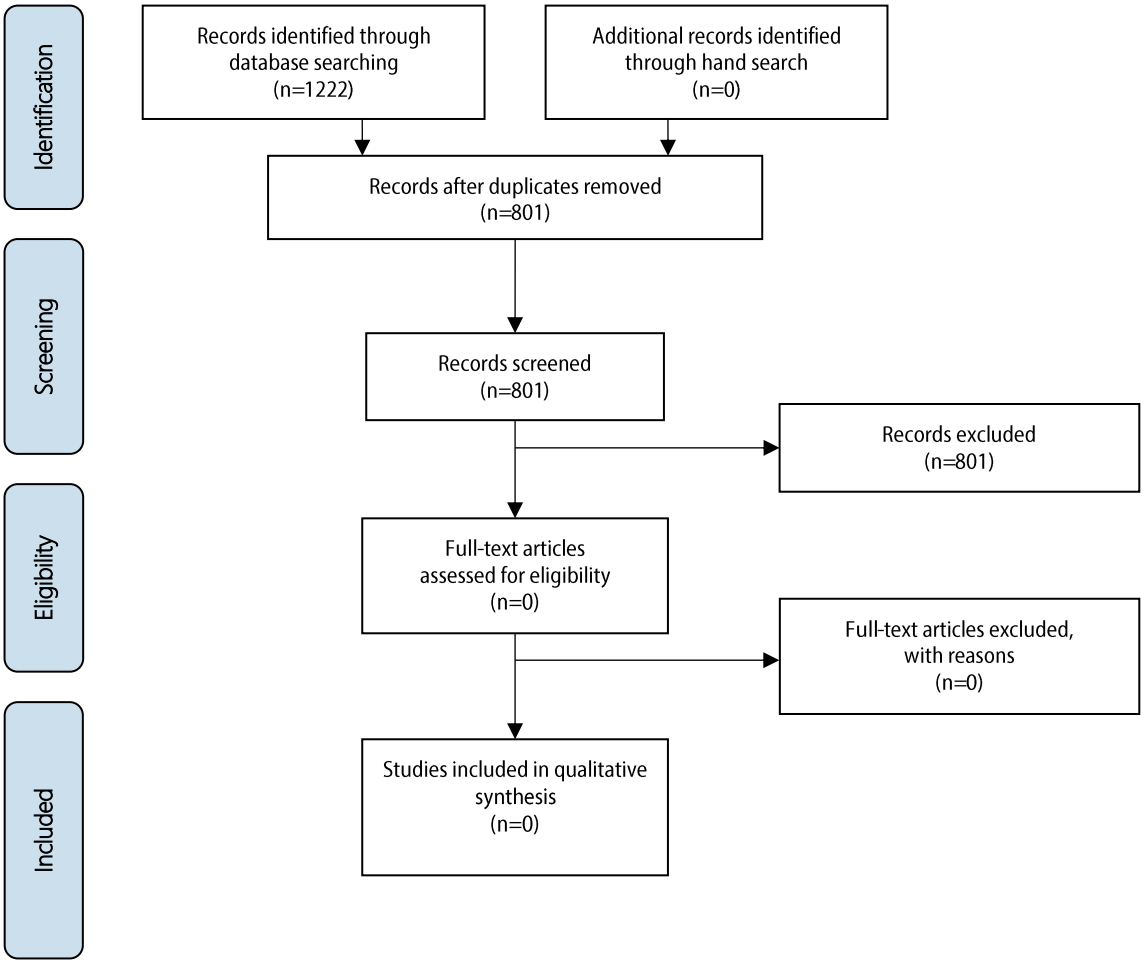


Figure 3-2: Flow chart of study selection (PRISMA Flow Diagramm): RCTs on population-based CKD screening

3.3 Data extraction of included systematic reviews

Table 3-1: Systematic reviews of risk-based Screening for CKD

Author, year	Gheewala, 2018 [18]	Korsa, 2025 [19]
Country	Australia	Australia
Funding	No funding	NR
Conflict of interest	No conflict of interest	1/5 Baxter, Fresenius, Roche
Intervention	Risk factor-based CKD screening (targeted screening) in any community-based setting performed by any healthcare professional	Risk factor-based CKD screening in primary care by any healthcare professional
Intervention – measurements/methods used	dipstick urinalysis: n=1 eGFR+ACR: n= 5 dipstick urinalysis +SCr: n= 1 eGFR+ dipstick urinalysis: n= 2 calculation of eGFR: CKD-EPI formula (n=3), MDRD formula (n=4)	eGFR only: n=3 eGFR+ACR: n=12 eGFR+ACR+Cystatin C: n=1 eGFR+dipstick proteinuria/MAU: n=4 eGFR+dipstick proteinuria/MAU+ SCr: n=1 eGFR+ACR+dipstick+Cystatin C: n=1 dipstick proteinuria/MAU+SCr: n=1 eGFR+dipstick proteinuria/MAU: n=1 Calculation of eGFR: CKD-EPI formula (n=12), MDRD formula (n=7), Cockroft Gault formula (n=1), combined eGFRcreat-cyst n=1)
Intervention- Method for Screening or risk assessment	both kidney damage and kidney function tests; n=8	Both kidney damage and kidney function n=20 Urinalysis (spot urine, dipstick or 24h collection): n= 16 Laboratory blood tests for SCr: n=11 POCT for SCr: n=7 Risk assessment with QKidney: n=1 Online pathway, customised software, Digital tool: n=3
Intervention – testing for chronicity	Repeated tests: n=4	Repeated tests: n=4
Comparator	No comparator	No comparator or standard of care (no screening)
Indication	Adults (≥18 years) with ≥1 risk factor from the following: diabetes, hypertension, CVD, and family history of kidney disease	Adults ≥18 years screened for CKD based on ≥1 known CKD risk factor including diabetes, CVD, obesity, family history of CKD, personal history of AKI, age >60 y, smoker, or vulnerable indigenous people
Study design	Systematic review without meta-analysis	Systematic review without meta-analysis
Number of included studies	9 (prospective cohort studies, n=6; cross-sectional studies, n=3)	24 (prospective cohort studies, n=12; cross-sectional studies, n=10; cluster RCTs, n=2)
Number of patients, n	164.821(mean age of participants between 46 and 65.3 years)	1.962.054 (mean age between 40.5 and 74 years)

Inclusion Criteria	■ observational studies (cross-sectional, case-control and prospective cohort) of targeted screening interventions that were implemented in a community-based setting, specifically aimed to identify people with undiagnosed CKD. ■ the screening program was required to have targeted adults (≥18 years) and multiple CKD risk factors from the following: diabetes, hypertension, CVD, and family history of kidney disease. ■ Screening programs could have been implemented in any community setting and performed by any healthcare professional. ■ There were no restrictions imposed based on the length of follow-up of outcomes. ■ Studies that were retrospective in nature and of epidemiological design were excluded from this review.	■ Studies that fell under the PICOs scheme defined ■ RCTs, pre/post studies from screening programs and any prospective observational studies (cross-sectional, cohort, longitudinal) ■ Operational definitions: ■ Risk factor-based screening: use of screening test(s) in individuals with at least one risk factor to detect undiagnosed CKD in primary care setting by any healthcare professional ■ CKD: defined per the KDIGO guideline as reduced kidney function (eGFR < 60ml/min/1.73m2 and/or kidney damage presenting for 3 months or more ■ Primary health care is defined as health centres, primary care clinincs, aged care centres, nursing homes, community health care, community pharmacies, general practices and other places excluding hospital settings.
Follow-up (months)	0.5 to 3 months	0.5 to 15 months
Loss to follow-up, n (%)	NR	NR
Ris of bias of included studies	Moderate (n=8) to serious risk of bias (n=1, due to missing data) assessed with Cochrane ACROBAT-NRSI	High quality to moderate (n=21) RCTS: 61.5% and 76.9% assessed with JBI risk-of-bias-assessment tool >70% score: high 50%: moderate <50% low
Outcomes		
Benefits		
All-cause mortality	NR	NR
CKD-specific mortality	NR	NR
Morbidity (improvement of kidney function, progression to dialysis)	NR	NR
Positive screening tests, %	n=8 positive results of kidney damage: ranged from 11.4% to 60.3% by dipstick test, and 8% to 35% by ACR measurement. positive results of a decline in kidney function: 12.8% by SCr measurement and 7% to 26.1% by eGFR combined (i.e. kidney damage and kidney function) positive screening test results at follow-up (n=4): 20.4% to 56%	n=22 decreased kidney function measured by eGFR ranged from 2.6%-43.9% and from 5.5%- 12.8% by SCr test. kidney damage measured by ACR: 5.3%-35% kidney damage measured by dipstick test: 7.2% - 60.3% combined abnormal test results (n=14): 2.9%- 56%
Confirmed CKD diagnoses on follow-up, %	n=2 20.5% and 17.1% of screened participants 1 study reported a CKD diagnosis in 9 participants (of 889, i.e. 1%) at follow-up; however, the overall percentage of this and tests used	n=4 4.4%-17.1% of screened patients 1 study based on EHR in high-risk patients reported statistically significant changes in the rate of CKD screening and diagnosis from baseline

	for diagnosis was unclear)	Screening: baseline: 4.5% to endpoint: 5.8%, OR 1.18 (1.09-1.28) Diagnosis: baseline: 0.48% to endpoint: 1.55%(p<0.001)
Medication initiation, %	NR	NR
Harms		
Overdiagnosis/Misdiagnosis	NR	NR
Psychosocial burden (stress, unnecessary follow-up tests)	NR	NR
Author's conclusion	Our analysis shows that a considerable percentage of participants are being identified with CKD by targeted screening. However, data on the percentage of participants for whom follow-up was successful and who were diagnosed with CKD at follow-up, as well as data on loss to follow-up, was either unclear or not reported in many studies. Hence, it is difficult to draw definitive conclusions on the effectiveness of targeted screening. We recommend that future studies should be designed such that follow-up of screened participants is conducted and reported at regular intervals to allow interpretation of the effectiveness of screening programs. Furthermore, screening programs should use simultaneous testing approaches, and CKD should be classified using both eGFR and albuminuria categories. This will help prevent over-diagnosis and labelling the healthy as diseased in the community.	Overall, risk-factor based screening was found to be effective in detecting individuals living with CKD in primary care settings. However, most of these findings were based on one-time estimations of kidney markers, confirmatory tests or follow-ups recommended by clinical guidelines were seldom performed, and the risk of developing CKD was either self-reported or identified from EHS, rather than established using validated risk assessment tools. In addition, most studies were observational, hence causal relationships could not be inferred. This might hinder us from providing a definite conclusion on the effectiveness of targeted screening. RCT studies employing risk assessment with validated tools coupled with POCTs or clinical laboratory testing that involve confirmatory tests for kidney markers should be conducted to establish the clinical and cost-effectiveness of risk-factor based CKD screening.

Legend:

ACROBAT-NRSI – A Cochrane Risk Of Bias Assessment Tool for Non Randomized Studies of Interventions, AKI – Acute Kidney Injury, CKD – Chronic Kidney Disease, CKD-EPI – Chronic Kidney Disease Epidemiology Collaboration, CVD – Cardiovascular Disease, eGFR – estimated Glomerular Filtration Rate, JBI – Johanna Briggs Institute, KDIGO – Kidney Disease: Improving Global Outcomes, MAU – microalbuminuria, MDRD – Modification of Diet in Renal Disease, NR – not recorded, OR – odds ratio, POCT – Point Of Care Testing, RCT – randomized controlled trial, SCr – Serum Creatinine, (U)ACR – (urinary) Albumin Creatinine Ratio

Table 3-2: Systematic reviews of population-based Screening for CKD

Author, year	Okpechi, 2022 [20]
Country	Multinational
Funding	ISN initiative, unrestricted educational grant from Astra Zeneca
Conflict of Interest	7/20 Fresenius, Astra Zeneca, Bayer, Boehringer-Ingelsheim, ISN,Baxter Healthcare, AKEBIA, Calliditas, Omeros, Otsuka, Pfizer, Travere, GlaxoSmithKline, Biocon, Zudis Cadilla, Nephro Plus
Intervention	CKD Screening, CKD early identification programs, CKD detection programs, CKD awareness programs
Intervention – measurements/methods used	SCr/eGFR+ urine dipstick/UACR: n=207 (71.4%) SCr/eGFR only: n=43 (14.8%) Dipstick/UACR only: n=40 (13.8%) + Cystatin C: n=3 (1%)
Intervention- Method for Screening or risk assessment	eGFR: CKD-EPI: n=85 (29.3%) Cockcroft-Gault: n=30 (10.3%) MDRD: n=150 (51.7%) Other: (Japanese) n=3: (1%)
Intervention – testing for chronicity	20% of all studies performed repeat testing 24.3% of targeted studies vs 17.5% of population-based studies
Comparator	No comparator / standard of care (if applicable)
Indication	Any adult population >18 years of age
Study design	Scoping review
Number of included studies	270 studies of 290 programs (cross-sectional studies n=246; prospective studies n=17; database review n=34); population-based studies n=63.1%; targeted studies n=36.9%
Number of patients, n	3.721.092 participants (mean age of participants between 46 and 65.3 years)
Inclusion Criteria	all study designs The following studies were excluded: ■ early identification programs for children ■ early identification programs for AKI, urologic diseases or CKD risk factors (diabetes, hypertension) ■ longitudinal studies of screened populations focused on other outcomes such as mortality, rates of GFR rate decline to kidney failure or quality of life ■ Organ donor screening or awareness programs ■ Review articles, editorials etc.
Follow-up (months)	<3m: n=36 (12.4%), 3-12m: n=75 (25.9%), >12m: n=84 (29%), NR: n=95 (32.8%)
Loss to follow-up, n (%)	NR
Ris of bias of included studies	Not performed
Outcomes	

Benefits	
All-cause mortality	NR
CKD-specific mortality	NR
Morbidity (improvement of kidney function, progression to dialysis)	NR
Positive screening tests, overall %, median (IQR)	CKD Prevalence total (n=209) 0-76.5%, 8.8 (4.3-16.1) Population-based studies (n=131): 0-30.3% (n=131), 8 (3.0-11.4) Risk-based studies (n=78): 0-76.5%, 14.8 (6.4-25.5) ■ Hypertension(n=6): 28.3 (24.9-44.5) ■ Diabetes mellitus (n=22): 21.1 (15.5-25.5) Albuminuria prevalence total (n=163): 0.2-57%, 12.5 (6.7-17.2) Population based studies (n=113): 0.2-46.3%, 11.2(6.2-17.2) Risk-based studies (n=50): 1,1-57%, 17.9 (10.9-33.4) ■ Hypertension (n=3): 11.8 (9.3-13.4) ■ Diabetes mellitus (n=15): 32.7 (19.1-39.8)
Confirmed CKD diagnoses on follow-up, %	NR
Medication initiation, %	Any pharmacotherapy initiated: 2.8% 4.7% in targeted vs 1.6% in population-based interventions
Harms	
Overdiagnosis/Misdiagnosis	NR
Psychosocial burden (stress, unnecessary follow-up tests)	NR
Author's conclusion	Methods for early CKD identification vary worldwide, often leading to variations in the reported prevalence. Efforts to standardize measurement methods for early detection focusing on high-risk populations and ensuring appropriate interventions are available to those identified with CKD will improve the value of programs and improve patient outcomes.

Legend: ACROBAT-NRSI – A Cochrane Risk Of Bias Assessment Tool for Non Randomized Studies of Interventions, AKI – Acute Kidney Injury, CKD – Chronic Kidney Disease, CKD-EPI – Chronic Kidney Disease Epidemiology Collaboration, CVD – Cardiovascular Disease, eGFR – estimated Glomerular Filtration Rate, JBI – Johanna Briggs Institute, KDIGO – Kidney Disease: Improving Global Outcomes, m – months, MAU – microalbuminuria, MDRD – Modification of Diet in Renal Disease, NR – not recorded, OR – odds ratio, POCT – Point Of Care Testing, SCr – Serum Creatinine, (U)ACR – (urinary) Albumin Creatinine Ratio

3.4 Risk of bias assessment of included systematic reviews

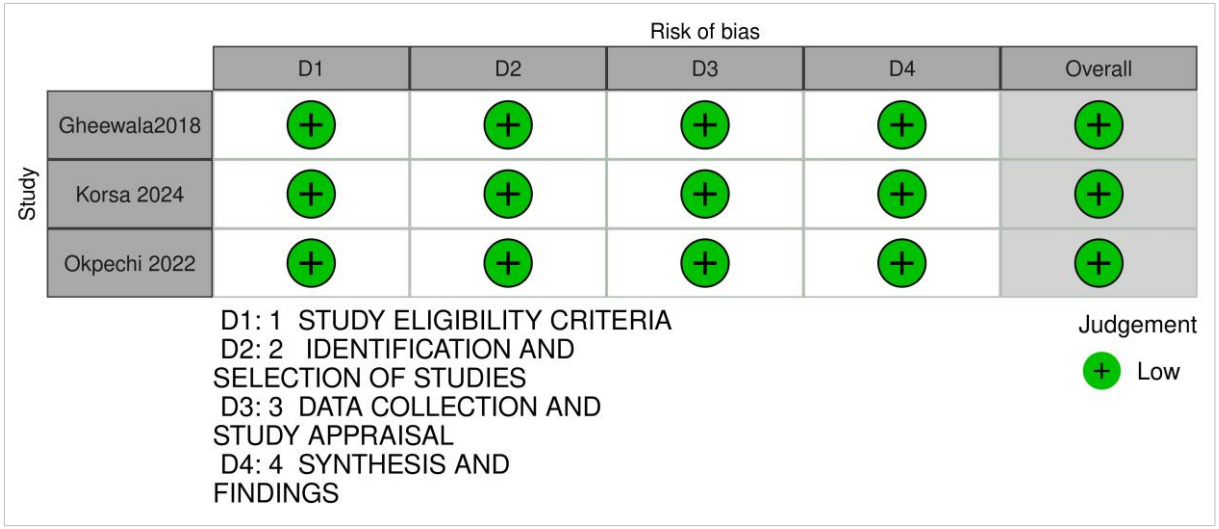


Figure 3-3: Risk of bias tools -

ROBIS source: Resources | Bristol Medical School: Population Health Sciences | University of Bristol
Figure source: Risk of bias tools - robvis (visualization tool)

3.5 Data extraction of clinical guidelines

Table 3-3: Clinical guidelines for CKD Screening

Guideline	Recommendation	Grade of recommendation	Level of evidence
Deutsche Gesellschaft für Allgemeinmedizin und Familienmedizin (DEGAM), 2024 (revision planned 2029) [21] **S3-Leitlinie: Versorgung von Patient*innen mit chronischer, nicht-nierenersatz-therapiepflichtiger Nierenkrankheit in der Hausarztpraxis** Based on KDIGO (2024) and NICE (2021) as well as several other guidelines	SCREENING		
	■ In asymptomatic adults without risk factors for CKD, screening for CKD should not be recommended.	B	Ib
	■ To assess kidney function in patients with diabetes mellitus, eGFR should be measured once annually.	B	II
	■ In patients with newly diagnosed hypertension, a serum creatinine test with eGFR is recommended. If eGFR is < 60 ml/min/1.73 m^2, a urine test for UACR should be performed.	A	II
	■ In patients receiving temporarily nephrotoxic medications, the need to assess eGFR before and after treatment should be considered.	n/a	GCP
	■ In patients on long-term potentially nephrotoxic medications, renal function should be monitored at least once.	n/a	GCP
	■ Individuals with close relatives who have a hereditary kidney disease should be informed about the possibility of nephrology and, if appropriate, genetic counselling.	n/a	GCP
	CONFIRMED DIAGNOSIS		
	■ If eGFR < 60 ml/min/1.73 m^2 is observed at first testing, a repeat eGFR measurement after 3 months should be performed to confirm the diagnosis of CKD.	A	I
	■ At initial diagnosis of CKD, the UACR should be measured.	A	I
	■ Hematuria detected via a positive dipstick test should be confirmed by a second, independent dipstick test.	B	II
	■ When a CKD diagnosis is made, blood pressure should be measured and monitored.	A	I
	■ In case of a CKD diagnosis, a one-time ultrasound examination of the kidneys and urinary tract should be recommended.	n/a	GCP
	■ To estimate cardiovascular risk in patients with CKD but without established cardiovascular disease, a validated risk score should be used.	n/a	GCP
	■ For referral to nephrology, an assessment of the risk of CKD progression to kidney failure (based on eGFR and UACR) should be performed. This should take into account age, comorbidities, life expectancy, and individual health goals. Risk scores can be used for this purpose.	n/a	GCP
	■ In all newly diagnosed CKD cases with eGFR < 30 ml/min/1.73 m^2, a referral to nephrology should be recommended, considering life expectancy and individual health goals.	n/a	GCP
NICE, 2021 [23] Chronic Kidney Disease: Assessment and Management	Screening: No formal recommendation. ■ 1.1.20 Monitor GFR at least annually in adults, children and young people who are taking medicines that can adversely affect kidney function, such as calcineurin inhibitors (for	n/a	n/a

	example, ciclosporin or tacrolimus), lithium or non-steroidal anti-inflammatory drugs (long-term chronic use of NSAIDs). ■ 1.1.21 Offer testing for CKD using eGFRcreatinine and ACR to adults with any of the following risk factors: diabetes • hypertension • previous episode of acute kidney injury • cardiovascular disease • structural renal tract disease, recurrent renal calculi or prostatic hypertrophy • multisystem diseases with potential kidney involvement, for example, systemic lupus erythematosus • gout • family history of end-stage renal disease (GFR category G5) or hereditary kidney disease • incidental detection of haematuria or proteinuria. ■ 1.1.22 Offer testing for CKD using eGFRcreatinine and ACR to children and young people with any of the following risk factors: • previous episode of acute kidney injury • solitary functioning kidney.e1.1.23eConsider testing for CKD using eGFRcreatinine and ACR in children and young people with any of the following risk factors: low birth weight (2,500 g or lower) • diabetes • hypertension • cardiac disease • structural renal tract disease or recurrent renal calculi • multisystem diseases with potential kidney involvement, for example, systemic lupus erythematosus • family history of end-stage renal disease (GFR category G5) or hereditary kidney disease • incidental detection of haematuria or proteinuria.e1.1.24 Do not use any of the following as risk factors indicating testing for CKD in adults, children and young people: age • gender • ethnicity • obesity in the absence of metabolic syndrome, diabetes or hypertension. ■ 1.2.1 Classify CKD in adults using a combination of GFR and ACR categories. Be aware that: increased ACR is associated with increased risk of adverse outcomes • decreased GFR is associated with increased risk of adverse outcomes • increased ACR and decreased GFR in combination multiply the risk of adverse outcomes.		
UKNSC, 2010 [22] Appraisal for Screening for Glomerulonephritis	■ Screening for kidney disease including glomerulonephritis currently not recommended (according to the UKNSC website Kidney disease - UK National Screening Committee (UK NSC) - GOV.UK ■ There should be evidence from high quality Randomised Controlled Trials that the screening programme is effective in reducing mortality or morbidity.	n/a	n/a
USPSTF, 2014 [24] Chronic Kidney Disease: Screening	■ The USPSTF concludes that the evidence is insufficient to assess the balance of benefits and harms of routine screening for CKD in asymptomatic adults. ■ Recommendation outdated; UPDATE CURRENTLY IN PROGRESS	I (insufficient evidence)	n/a
KDIGO 2024 [10] Clinical Practice Guideline for the Evaluation and	Screening: no specific recommendation Despite the increasing recognition of the true burden of CKD, there remains controversy and lack of consensus as to the utility of population screening for CKD or targeted screening programs due to		

Management of Chronic Kidney disease	the complexity of the underlying sociopolitical and resource environment. Public health policy has a role to play in identifying and addressing risk factors to prevent CKD, to identify CKD early, and to delay its progression and associated adverse outcomes. Incorporating evidence-based treatment of people with CKD with sodium-glucose cotransporter-2 (SGLT2) inhibitors, together with a systematic review in people with diabetes and hypertension, suggests that screening adults for CKD could now be cost-effective. Given that chronic disease detection and prevention frameworks have been deployed for other disease and risk factor conditions, in our view, CKD detection strategies should be implemented for high-risk people.		
	1.1 Detection and evaluation of CKD ■ Practice Point6 1.1.1.1: ■ Test people at risk for and with CKD using both urine albumin measurement and assessment of GFR. ■ Practice Point 1.1.1.2: Following incidental detection of elevated urinary albumin-to-creatinine ratio (ACR), hematuria, or low estimated GFR (eGFR), repeat tests to confirm presence of CKD.	n/a	n/a
	1.1.2 Methods for staging of CKD ■ Recommendation 1.1.2.1: In adults at risk for CKD, we recommend using creatinine-based estimated glomerular filtration rate (eGFRcr). If cystatin C is available, the GFR category should be estimated from the combination of creatinine and cystatin C (creatinine and cystatin C based estimated glomerular filtration rate [eGFRcr-cys])	1 („we recommend“)	B (moderate)
	1.1.3 Evaluation of chronicity ■ Practice Point 1.1.3.1: Proof of chronicity (duration of a minimum of 3 months) can be established by: (i) review of past measurements/estimations of GFR; (ii) review of past measurements of albuminuria or proteinuria and urine microscopic examinations; (iii) imaging findings such as reduced kidney size and reduction in cortical thickness; (iv) kidney pathological findings such as fibrosis and atrophy; (v) medical history, especially conditions known to cause or contribute to CKD; (vi) repeat measurements within and beyond the 3-month point. ■ Practice Point 1.1.3.2: ■ Do not assume chronicity based upon a single abnormal level for eGFR and ACR, as the finding could be the result of a recent acute kidney injury (AKI) event or acute kidney disease (AKD). ■ Practice Point 1.1.3.3: Consider initiation of treatments for CKD at first presentation of decreased GFR or elevated ACR if CKD is deemed likely due to presence of other clinical indicators.	n/a	n/a

[6] Practice points are consensus-based statements representing the expert judgment of the Work Group and are not graded [10].

	1.2.2 Guidance to physicians and other healthcare providers ■ Practice Point 1.2.2.1: Use SCr and an estimating equation for initial assessment of GFR.	n/a	n/a
	1.2.2 Guidance to physicians and other healthcare providers ■ Recommendation 1.2.2.1: We recommend using eGFRcr-cys in clinical situations when eGFRcr is less accurate and GFR affects clinical decision-making.	1	C (low)

Legend: AKI – Acute Kidney Injury, AKD – Acute Kidney Disease, CKD – Chronic Kidney Disease, CKD-EPI – Chronic Kidney Disease Epidemiology Collaboration, CTFPHC – Canadian Task Force on Preventive Health Care, CVD – Cardiovascular Disease, DEGAM – Deutsche Gesellschaft für Allgemeinmedizin und Familienmedizin, (e)GFR – (estimated) Glomerular Filtration Rate, IQWIG – Institut für Qualität und Wirtschaftlichkeit im Gesundheitswesen, KDIGO – Kidney Disease: Improving Global Outcomes, MAU – microalbuminuria, MDRD – Modification of Diet in Renal Disease, NICE – National Institute for Health and Care Excellence, NR – not recorded, SCr – Serum Creatinine, SGLT2 inhibitors – sodium glucose cotransporter-2 inhibitors, (U)ACR – (urinary) Albumin Creatinine Ratio, UKNSC – UK National Screening Committee, USPSTF – US Preventive Services Task Force

3.6 Search strategies

MEDLINE via Ovid

Database: Ovid MEDLINE(R) ALL <1946 to May 05, 2025>

Search Strategy:

---

1 exp Mass Screening/ (151100)

2 screening*.mp. (868049)

3 1 or 2 (878712)

4 *Renal Insufficiency, Chronic/ (37496)

5 (chronic adj ((kidney* or renal) adj (disease* or insufficien*))).mp. (101724)

6 CKD.ti,ab. (51960)

7 4 or 5 or 6 (110695)

8 3 and 7 (4120)

9 limit 8 to (meta analysis or "systematic review") (138)

10 ((comprehensive* or integrative or systematic*) adj3 (bibliographic* or review* or literature)) or (meta-analy* or metaanaly* or "research synthesis" or ((information or data) adj3 synthesis) or (data adj2 extract*))).ti,ab. or (cinahl or (cochrane adj3 trial*) or embase or medline or psyclit or (psycinfo not "psycinfo database") or pubmed or scopus or "sociological abstracts" or "web of science").ab. or ("cochrane database of systematic reviews" or evidence report technology assessment or evidence report technology assessment summary).jn. or Evidence Report: Technology Assessment*.jn. or ((review adj5 (rationale or evidence or safety or effectiveness)).mp. and review.pt.) or meta-analysis as topic/ or Meta-Analysis.pt. (882901)

11 8 and 10 (339)

12 9 or 11 (339)

13 limit 12 to (english or german) (331)

14 remove duplicates from 13 (328)

06.05.2025

The Cochrane Library

Search Name: Screening for chronic kidney disease

Last Saved: 07/05/2025 15:59:29

ID Search

#1 MeSH descriptor: [Mass Screening] explode all trees

#2 (screening):ti,ab,kw

#3 #1 OR #2

#4 MeSH descriptor: [Renal Insufficiency] this term only

#5 (chronic NEAR (kidney* OR renal) NEAR (disease* OR insufficien*)) (Word variations have been searched)

#6 (CKD):ti,ab,kw

#7 #4 OR #5 OR #6

#8 #3 AND #7 in Cochrane Reviews, Cochrane Protocols

25 Hits

Epistemonikos

Full query: (title:(screening AND ("chronic kidney disease" OR "chronic renal Insufficiency" OR CKD)) OR abstract:(screening AND ("chronic kidney disease" OR "chronic renal Insufficiency" OR CKD)))

Limited to Publication type filter Systematic Review

209 Hits

07.05.2025

GIN und TRIP databases

"CKD" or "Chronic kidney disease" AND "Screening"

0 Hits

10.07.2025

3.7 Search strategy study register

“CKD” OR “chronic kidney disease” OR chronic renal insufficiency AND “Screening”

Date of Search 05.07.2025

Hits: 59

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