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Treatment Optimization and Standard of Care Adherence in CKD Primary Care: the TOSCA-CKD project

Articoli originali

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ABSTRACT

Background. Effective collaboration between general practitioners (GPs) and nephrologists is crucial for optimizing the management of chronic kidney disease (CKD). The TOSCA-CKD project (Treatment Optimization and Standard of Care Adherence in CKD Primary Care) aimed to evaluate the implementation of guidelines and the use of nephroprotective therapies in primary care.

Methods. Clinical data were collected from the medical records of GPs across 12 Italian regions. The data were analyzed at baseline (T0) and after 6 months (T6) of collaboration with nephrologists. During this observational period, GPs were involved in remote education programs, which included expert-led webinars and clinical case-based learning.

Results. A total of 76 GPs and 9 nephrologists were involved in the study, evaluating a cohort of 124,759 patients. There was an increase of 23.3% in the uACR test from T0 to T6 (3.0% vs. 3.7%; $p < 0.001$). Similarly, there was an increase of 15.2% in the use of eGFR from T0 to T6 (29.7% vs. 34.2%; $p < 0.001$). The rate of CKD diagnosis increased by 17.5% among patients with eGFR < 60 mL/min/1.73 m² (from 4% to 4.7%) and by 40% among patients with ACR > 30 mg/g (from 0.5% to 0.7%). The use of ACEi/ARBs remained stable at approximately 50%, while the treatment with SGLT2i, the new standard of care according to the current CKD guidelines, increased by 29.8% (from 4.7% to 6.1%).

Conclusions. The TOSCA-CKD project demonstrated that GPs' remote educational program and a structured co-management approach significantly enhanced the early identification and improved the management of CKD in primary care.

KEYWORDS: Chronic Kidney Disease, Primary Care, Guidelines Directed Medical Therapy, Screening, SGLT2i

Introduction

Chronic kidney disease (CKD) is a prevalent and often underrecognized condition, affecting an estimated 700-840 million individuals worldwide [1]. It is characterized by persistent structural and/or functional kidney abnormalities, typically followed by progressive kidney damage. CKD is defined by the 2024 KDIGO guidelines as an estimated glomerular filtration rate (eGFR) of ≤60 mL/min/1.73 m², measured over a duration of at least three months, irrespective of the underlying etiology. CKD can also be diagnosed in the presence of kidney damage for a minimum of 3 months, indicated by structural abnormalities (e.g., detected through imaging or renal biopsy), persistent urine sediment abnormalities, or more frequently elevated urine albumin-to-creatinine ratio (ACR ≥30 mg/g).

The guidelines further classify CKD based on eGFR, divided into five stages (G1-G5), and on the degree of albuminuria, categorized into three stages (A1-A3). CKD is associated with an increased risk of cardiovascular disease and progression to end-stage kidney disease (ESKD). Currently, CKD is the 10th leading cause of death in the United States [2], with projections indicating it will become the 5th leading cause of death by 2040 [3].

Epidemiological data from the National Health and Nutrition Examination Survey III (NHANES III) report a global prevalence of CKD of approximately 10%. In Italy, the prevalence of CKD is estimated at 7.8% in women and 8.1% in men, based on data from the CARHES study [4]. This burden is expected to increase due to several factors, including population ageing, the rising incidence of comorbidities such as type 2 diabetes (T2D), heart failure (HF), and hypertension (HTN), as well as increased awareness of the importance of early CKD diagnosis, supported by the availability of simple, reliable, and cost-effective diagnostic tests.

The recent international REVEAL-CKD study highlighted the importance of early detection and prompt therapeutic intervention in CKD management. This study not only assessed the prevalence of undiagnosed early-stage CKD (stage 3), but also explored the associated risk factors (T2D, HTN, HF) and the impact of early diagnosis and appropriate therapeutic strategies on slowing disease progression. The REVEAL-CKD study found high rates of underdiagnosis, ranging from 61.6% to 95.5% across different countries, including the United States, Italy, Germany, Japan, and France. Specifically, the Italian cohort revealed that 77% of patients in stage 3 were undiagnosed (with 83.0% in stage 3a and 64.8% in stage 3b). Further analysis of the international cohort revealed that among patients who were diagnosed with stage 3 CKD, there was a notable reduction in the rate of eGFR decline, dropping from an average of -4.12 mL/min per year to just -0.30 mL/min per year over a two-year period. These findings emphasize that early diagnosis, followed by appropriate treatment and monitoring in accordance with clinical guidelines, can significantly slow the progression of CKD and potentially reduce the risk of adverse outcomes such as end-stage kidney disease [5].

The key role of GPs in the early identification of CKD was explored by the DANTE CKD pilot study (Disease Awareness Innovation Network for Chronic Kidney Disease Identification in General Practice) [6]. This study demonstrated the crucial role of early diagnosis and effective co-management between GPs and nephrologists in optimizing care pathways and potentially delaying disease progression. Through a regional experience, the study showed that targeted training and close collaboration between GPs and nephrologists significantly increased GPs' awareness of CKD, facilitating earlier diagnosis, especially in high-risk patients, such as those with T2D, HTN, and HF, conditions that are strongly associated with kidney disease. The impact was evident in the increased proportion of patients tested for eGFR and uACR.

After the impressive results achieved through this regional experience within six months of collaboration between GPs and nephrology specialists, the national ENDORSE project (Early Chronic

Kidney Disease Point of Care Screening) [7] was developed to evaluate, across Italy, the clinical and economic implications of GPs' targeted training to enhance CKD early diagnosis. The ENDORSE project involved over 50 GPs and a cohort of more than 110,000 individuals, aiming to build a national collaborative network connecting nephrologists and primary care providers across 11 regions. After six months, the proportion of patients tested for eGFR increased by 44.7%, while testing for uACR rose by 95.2%. Overall, the number of patients screened according to KDIGO guidelines increased by 128.9%, demonstrating the effectiveness of medical networking and targeted training in improving early detection of CKD. In addition, to assess the potential economic benefits of early CKD diagnosis, a Budget Impact Analysis (BIA) was conducted within the enrolled cohort, considering a timeframe of 5 years and varying rates of eGFR decline. The analysis projected cumulative savings of €1.7 million over five years in the study cohort, and an estimated savings of €106.6 million when applied to the entire Italian CKD population.

Building on the evidence of these prior initiatives, the TOSCA-CKD project (Treatment Optimization and Standard of Care Adherence in CKD Primary Care) was designed to further enhance early identification of CKD patients and ensure timely referral to nephrologists for optimized treatment. While the DANTE and ENDORSE projects focused primarily on early diagnosis, TOSCA-CKD aimed to evaluate in primary care settings the implementation of clinical guidelines and the use of nephroprotective therapies, including RAAS inhibitors and SGLT2 inhibitors, to better manage disease progression. By reinforcing both diagnostic and therapeutic management, TOSCA-CKD aims to further reduce the burden of CKD and improve patient outcomes through a more integrated and coordinated approach to care.

Methods

The TOSCA-CKD project involved 76 General Practitioners (GPs) from 12 different Italian regions, supported by 9 nephrologists and 1 tutor who provided technical assistance on the use of the clinical information system. GPs were suggested by the panel of nephrologists based on several selection criteria, aiming to ensure a representative and balanced sample. A fundamental inclusion criterion was the use of the Millewin electronic health record (EHR), a Class I medical device (EU Regulation 2017/745) authorized by the Italian Ministry of Health (ID 1847935), which is employed for the registration and storage of clinical data within the Italian National Health Service (SSN). Further criteria included the geographic representation of GPs, with participants selected from different regions to reflect the diversity of healthcare settings across the country, and the matching of GPs for similar patient loads to minimize potential biases related to differences in practice volume.

GPs involved in the TOSCA-CKD project participated in a series of structured training sessions conducted by nephrologists. These sessions were designed to update GPs on the latest clinical guidelines for the diagnosis, monitoring, and management of CKD, as well as its common comorbidities. The primary goal of the training was to strengthen GPs' skills in early CKD detection, improve their ability to manage the disease effectively, encourage collaborative networking with nephrologists, and ultimately ensure optimal care for patients.

At baseline (T0) and after 6 months (T6) of training and networking activities, participating GPs were asked to extract specific clinical data from their Millewin EHRs. The data collected included: number of patients evaluated, age, sex, comorbidities, estimated glomerular filtration rate (eGFR), albumin-to-creatinine ratio (ACR), ongoing pharmacological treatments, and the proportion of patients with eGFR < 60 mL/min/1.73m² and ACR> 30. All data collected were anonymized to ensure patient privacy and were then used for subsequent analysis.

Statistical analysis

The original dataset included 124,759 patients examined at baseline (T0) and 126,921 patients examined after six months (T6). A descriptive analysis was performed for patient demographics (age, gender) and the prevalence of comorbidities. Screening tests and the use of specific medications were assessed at both T0 and T6. The change (Delta) between T0 and T6 was calculated as the percentage difference.

Pearson's Chi-square test was used to assess the statistical significance of differences observed between T0 and T6. An alpha significance level of 0.05 was set for all statistical analyses. Data were analyzed using IBM SPSS Statistics software, version 28.

Results

The baseline characteristics [T0] of the 124,759 patients included in the cohort, whose data were extracted from Electronic Medical Records (EMRs) of 76 GPs across 12 Italian regions, are summarized in Table 1. The mean age of the cohort was 53.21 years (SD ± 20.87), with 52.8% of patients being female. Regarding comorbidities commonly associated with CKD, 8% of patients had T2D, 23.9% had HTN, and 1% had HF.

At the 6-month follow-up (T6), the demographic profile remained largely unchanged, with a total of 126,921 patients. The mean age was 52.93 years (SD ± 20.94), and the proportion of female patients was 52.9%. The prevalence of T2D, HTN, and HF was 8.5%, 25.3%, and 1.1%, respectively (Table 1).

Overall, a significant increase in uACR and eGFR tests was observed after the educational intervention (Table 2 and 3). Specifically, the proportion of patients undergoing uACR screening rose from 3.0% at T0 to 3.7% at T6, reflecting a 23.3% increase in screening ($p < 0.001$). Similarly, eGFR testing increased from 29.7% at T0 to 34.2% at T6, representing a 15.2% increase in the rate of testing ($p < 0.001$).

When analyzed by subgroup, a 15% increase in uACR screening was found among T2D patients ($p < 0.001$), and a 14.6% increase was observed in patients with HTN ($p < 0.001$). In contrast, for patients with HF, the change in uACR screening was not statistically significant ($p = 0.116$). In terms of eGFR testing, the rate among patients with diabetes increased by 8.6% ($p < 0.001$), while it rose by 7.3% among hypertensive patients ($p < 0.001$). Similarly, the increase in eGFR testing for HF patients did not reach statistical significance ($p = 0.129$).

The overall increase in screening activity among GPs, prompted by the training intervention, resulted in a higher number of new CKD diagnoses. From T0 to T6, the proportion of patients with eGFR <60 mL/min/1.73m² increased by 17.5%, from 4% to 4.7% ($p < 0.001$) (Figure 1a), while the proportion of patients with uACR ≥30 mg/g expanded by 40%, from 0.5% to 0.7% ($p < 0.001$) (Figure 1b).

Regarding pharmacological treatments, the percentage of use of different classes of drugs in patients with CKD (e-GFR <60 mL/min/1.73 m²) was assessed. Overall, adherence to clinical guidelines was found to be low, with no significant global changes from T0 to T6, except for the use of SGLT2i (Table 4, Figure 2a). Specifically, around half of the patients with CKD were prescribed ACEi (50.5% at T0 and 49.9% at T6). Similarly, the proportion of patients on angiotensin receptor blockers (ARBs) was 48.4% at T0 and 48.7% at T6. The ACEi/ARB combination therapy was used by 22.2% of patients at T0 and 22.6% at T6. Additionally, 44.9% of patients were prescribed diuretics at T0 and at T6.

SGLT2i were prescribed to 4.7% of patients at T0 and 6.1% at T6, reflecting a 29.8% increase ($p < 0.05$) (Figure 2b). It is worth noting that, during the study period, dapagliflozin was the only SGLT2

inhibitor approved in Italy for the treatment of CKD, regardless of diabetes status. Dapagliflozin accounted for more than half of all SGLT2i prescriptions, both at baseline and at T6 (2.6% and 3.5%, respectively), representing a 34.6% increase ($p < 0.05$).

COVARIATE	T0 (N=124759)	T6 (N=126921)
AGE		
Mean (SD)	53.21 (20.87)	52.93 (20.94)
SEX		
Male	58.825 (47.2%)	59.767 (47.1%)
Female	65.934 (52.8%)	67.154 (52.9%)
T2D		
Count (%)	9.951 (8)	10.725 (8.5)
HTN		
Count (%)	29.849 (23,9)	32.144 (25.3)
HF		
Count (%)	1.249 (1)	1.411 (1.1)

Table 1. Demographic and clinical characteristics of cohort population at T0 and T6. Type 2 Diabetes; HTN: Hypertension; HF: Hearth Failure; SD: Standard Deviation.

GROUP	T0	T6	DELTA (%)	p-value
OVERALL				
Count N° (%)	3,743 (3.0)	4,695 (3.7)	+23.3	**<0.001**[1]
T2D				
Count N° (%)	2,052 (20,6)	2,546 (23.7)	+15.0	**<0.001**[1]
HTN				
Count N° (%)	2,855 (9.6)	3,543 (11.0)	+14.6	**<0.001**[1]
HF				
Count N° (%)	177 (14.2)	231 (16.4)	+15.5	= 0.116

Table 2. Variation in uACR test prescribed between T0 and T6. uACR: Urine albumin-creatinine ratio; T2D: Type 2 Diabetes; HTN: Hypertension; HF: Heart Failure; [1]Pearson's Chi-square test was found to be statistically significant (p-value < 0.001).

GROUP	T0	T6	DELTA (%)	p-value
OVERALL				
Count N° (%)	37,055 (29.7)	43,466 (34.2)	+15.2	**<0.001**[1]
T2D				
Count N° (%)	5,662 (56.9)	6,631 (61.8)	+8.6	**<0.001**[1]
HT				
Count N° (%)	15,901 (53.3)	18,378 (57.2)	+7.3	**<0.001**[1]
HF				
Count N° (%)	735 (58.8)	871(61.7)	+4.9	= 0.129

Table 3. Variation in e-GFR test prescribed between T0 and T6. e-GFR: Estimated Glomerular Filtration Rate; T2D: Type 2 Diabetes; HT: Hypertension; HF: Heart Failure; [1]Pearson's Chi-square test was found to be statistically significant (p-value < 0.001).

DRUG	T0 (%)	T6 (%)	DELTA (%)	p-value
ACEi	50.5	49.9	-1.2	*Ns*
ARBs	48.4	48.7	+0.6	*Ns*
ARBs+ACEi	22.2	22.6	+1.8	*Ns*
SGLT2i	4.7	6.1	+29.8	**p<0.05**[1]
MRA	14.5	14.8	+2.1	*Ns*
DIURETICS	44.9	44.9	0	*Ns*
BETA BLOCKERS	52.8	53.1	+0.6	*Ns*
CALCIUM ANTAGONISTS	40.2	40.3	+0.2	*Ns*
LIPID LOWERING DRUGS	60.7	60.6	-0.2	*Ns*

Table 4. Drugs utilization in CKD patients (e-GFR<60 mL/min/m^2) between T0 and T6. e-GFR: Estimated Glomerular Filtration Rate; ACEi: Angiotensin-converting enzyme inhibitors; ARBs: Angiotensin Receptor Blockers; SGLT2i: Sodium-glucose cotransporter 2 inhibitors; MRA: Mineralcorticoid receptor antagonist. [1]Pearson's Chi-square test was found to be statistically significant (p-value <0.05); ns: statistically non-significant.

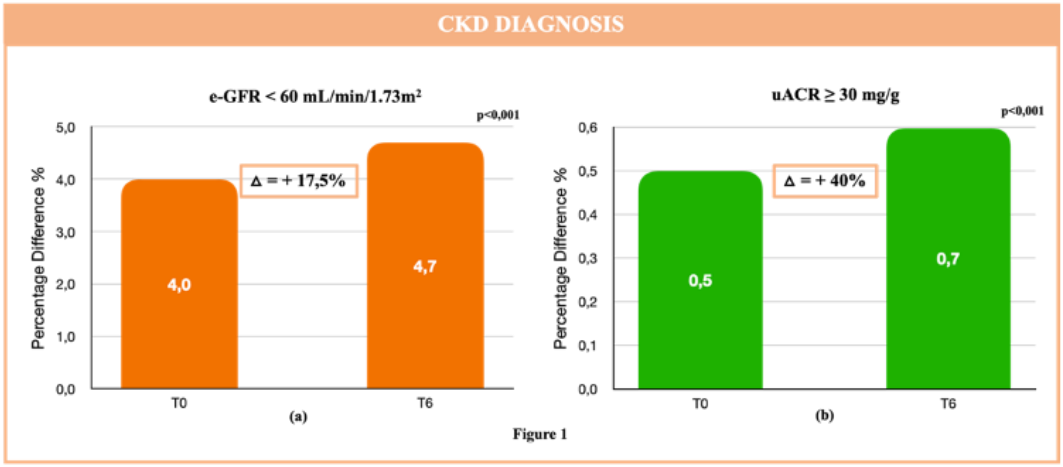

Figure 1. The proportion of patients diagnosed with CKD by 17.5% for patients with a glomerular filtration rate (e-GFR) < 60 mL/min/1.73 m² (a) and by 40% for patients with an albumin-to-creatinine ratio (ACR) ≥ 30 mg/g (b). CKD: Chronic Kidney Disease; e-GFR: estimated glomerular filtration rate; ACR: albumin-to-creatinine ratio.

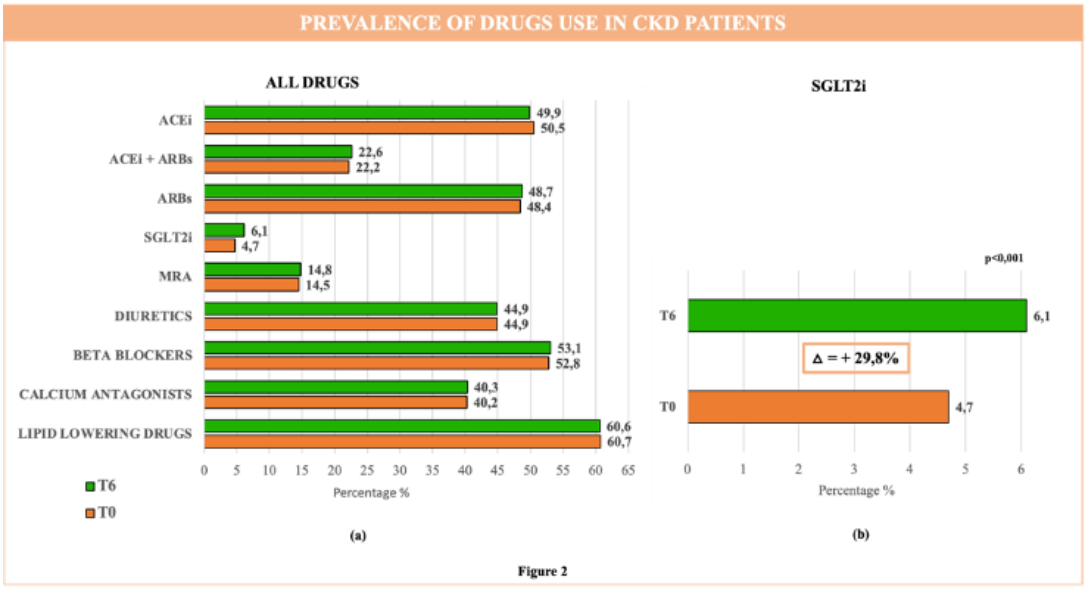

Figure 2. Use of ACEi and ARBs remained almost stable between T0 and T6 at around 50%, with no significant difference (a); use of sodium-glucose cotransporter 2 inhibitors (SGLT2i) increased by 29.8% from 4.7% to 6.1%; the difference was statistically significant (p value < 0.05) (b). ACEi: angiotensin-converting enzyme inhibitors; ARBs: angiotensin receptor blockers; SGLT2i: sodium-glucose cotransporter 2 inhibitors.

Discussion

CKD is a significant global health burden, associated with high morbidity, mortality, and substantial healthcare costs. A microsimulation model used in the INSIDE-CKD study assessed the clinical burden of CKD across eleven countries: Australia, Belgium, Brazil, Canada, China, Japan, Germany, Italy, France, Spain, the UK, and the US. It collected data on CKD prevalence, renal replacement therapy (RRT), comorbidities, and cardiovascular complications for each country [8].

For Italy, the model projected an increase in the CKD population from 3.9 million in 2021 to 4.4 million by 2026, representing a 14.7% rise in the estimated prevalence per 100,000 population. The profile of CKD is expected to shift towards more advanced stages (3b-5), with an estimated increase in RRT cases from 73,370 to 84,671. The financial impact on healthcare costs is projected to be

significant, with an anticipated rise of 10.8%, of which 53% will be attributed to the costs of renal replacement therapy. In 2021, CKD accounted for 3.2% of Italy's public healthcare spending, totaling approximately 4 billion euros.

In this context, GPs, who manage the majority of patients with or at risk of CKD, play a pivotal role in the early detection of the disease. Unfortunately, awareness among GPs remains suboptimal. In 2017, for example, the International Society of Nephrology's Global Kidney Health Atlas survey, conducted across 125 countries (representing approximately 93% of the world's population), found that 64% of respondents reported low or very low awareness of CKD in primary care settings [9]. To address this gap, Aminu K. Bello et al. stressed the importance of well-designed training programs, recommending hybrid models that combine webinars, face-to-face sessions, case study workshops, symposia, and online learning modules. These approaches aim to bridge knowledge gaps and facilitate the adoption of appropriate diagnostic and therapeutic pathways [10].

The TOSCA-CKD project, consistently with the results of the DANTE and ENDORSE studies, aimed to further demonstrate the value of training programs and GP-nephrologist networking in improving awareness and optimal management of CKD patients in the Italian real-world setting. The project successfully showed the effectiveness of educational programs in enhancing CKD awareness, leading to a significant increase in the routine use of diagnostic tests, particularly in high-risk populations. Specifically, the use of uACR and eGFR increased by 23.3% and 15.2%, respectively, over the study period, resulting in a corresponding rise in CKD diagnoses. In particular, the proportion of patients with eGFR <60 ml/min/1.73m² increased by 17.5%, while the proportion of patients with uACR ≥30 rose by 40%, with both changes being statistically significant.

In addition to early detection, timely implementation of appropriate therapeutic interventions, especially through specialist referral, is essential for effective CKD management. Significant pharmacological advancements have been made in the management of CKD in recent years, particularly with the introduction of SGLT2i. These medications have provided strong clinical evidence in slowing disease progression and reducing complications in CKD patients, irrespective of diabetes [11–13]. As a result, SGLT2i have become a cornerstone of CKD management, with international guidelines now recognizing them as the new standard of care for these patients.

The proven clinical benefits of SGLT2i may also lead to a reduction in healthcare costs, as outlined in previous studies. For example, an analysis conducted by McEwan et al., published in 2023, evaluated the economic impact of dapagliflozin treatment in addition to standard of care (SoC) compared to SoC alone, over a 3-year period. Specifically, applying the results of the DAPA-CKD study to a cohort of 100,000 patients, the economic analysis calculated the healthcare costs associated with managing end-stage kidney disease (ESKD), hospital admissions for heart failure (HHF), acute kidney injury (AKI), and all-cause mortality (ACM). The study found that treatment with dapagliflozin plus SoC resulted in a 33% reduction in total healthcare costs (equating to $264 million) over 3 years, due to a reduction in cardiorenal events [14]. Despite the robust evidence supporting their clinical and economic benefits, SGLT2i are still not widely adopted in clinical practice. A study conducted in the UK to assess the adoption of KDIGO 2024 guidelines and the appropriateness of CKD management in primary care revealed that only 17% of eligible patients were on SGLT2i treatment, most of whom were T2D patients. Importantly, patients at higher risk for adverse outcomes based on eGFR and albuminuria were less likely to receive SGLT2i therapy, as were non-diabetic patients. Although the time between the publication of KDIGO 2024 recommendations and the observational period of the project may have been too short to observe significant impact in clinical practice, these findings highlight the ongoing need for training and education for clinicians to ensure that patients at high risk of kidney disease progression receive the most appropriate treatments [15].

Further, the OPTIMIZE-CKD study by Tangri et al. highlighted the impact of treatment inertia in initiating nephroprotective therapies in patients with CKD [16]. This study specifically examined the use of SGLT2i in patients newly diagnosed with stages 3-4 CKD in Japan, Sweden, and the United States, after the approval of dapagliflozin in these countries. The results revealed that, more than 12 months post-approval, only 1.4%, 5.1%, and 1.3% of patients, respectively, had been treated with dapagliflozin. Notably, non-diabetic CKD patients, the majority of the cohort, were less likely to be prescribed dapagliflozin compared to those with T2D. This delay in the adoption of new therapies highlights the challenges associated with translating clinical evidence into practice and the persistence of treatment inertia, particularly in non-diabetic patients.

In Italy, a similar pattern of inertia in using nephroprotective therapies has been observed. The Annali AMD report from the Italian Associazione Medici Diabetologi (AMD) highlighted that, despite a general increase in the use of SGLT2i among patients with T2D (from 29% in 2022 to 35.8% in 2023), 62.5% of diabetic patients with concomitant CKD were still not receiving these medications. This finding points to the persistent gap in treatment, despite growing evidence of the SGLT2i efficacy in reducing kidney and cardiovascular events [17].

To further raise awareness among GPs and address the suboptimal management of CKD patients, the TOSCA-CKD study aimed to evaluate the use of nephroprotective drugs, such as RAASi and SGLT2i, in CKD patients (eGFR <60 mL/min/1.73m^2) during the observation period. The results confirm the underutilization of guideline-directed medical therapies (GDMT). At baseline (T0), only half of the patients were prescribed an ACEi (50.5%) or an ARB (48.4%), with these rates remaining almost unchanged at T6 (ACEi 48.7%, ARBs 49.9%). Conversely, for SGLT2i, a significant increase in treatment adoption was observed from T0 to T6, rising from 4.7% of patients to 6.1%, reflecting a 29.8% increase ($p < 0.05$). Among SGLT2i, dapagliflozin was the most frequently used drug, particularly due to its prescribing eligibility by nephrologists during the project period, with a 34.6% increase from T0 to T6.

One possible explanation for the lack of increase in the use of ACE inhibitors and ARBs from T0 to T6, in contrast to the observed rise in the use of SGLT2 inhibitors, could be the significant focus placed on this novel class of drugs within the context of the study, as they are recommended as first-line therapy by the guidelines. Given this emphasis, it is likely that, in the first instance, SGLT2 inhibitors were prioritized and added to patients already receiving ACE inhibitors or ARBs, particularly those with comorbidities such as diabetes or heart failure. This strategy reflects a gradual approach to therapy optimization, which is consistent with the phenomenon of therapeutic inertia. Moreover, it is important to acknowledge that RAAS inhibitors have historically been underused and are still subject to high rates of discontinuation and suboptimal dosing. The high rate of discontinuation may have confounded the potential introduction of new ACE inhibitors or ARBs during the study period.

However, although the TOSCA-CKD study showed a positive trend in SGLT2i use, reflecting the effectiveness of the educational intervention and improved GP-to-nephrologist referrals, the absolute number of CKD patients receiving SGLT2i treatment is still too low and far from what is needed to achieve optimal care, especially given the proven benefits of these medications in improving cardiorenal outcomes and reducing mortality.

The relatively short observation period of this study may have been insufficient to fully capture the optimization of all nephroprotective therapies as many patients identified at the 6-month follow-up may not have yet undergone a specialist evaluation, and thus, their treatment may not have been fully optimized. Nevertheless, the findings still highlight a persistent treatment gap, emphasizing the ongoing need to reduce delays and ensure CKD patients receive timely and appropriate care.

Conclusions

The TOSCA-CKD project, despite certain limitations, including the relatively short observation period, represents a clinically relevant initiative. The project demonstrated, in a real-world setting representative of Italian primary care settings, that remote GPs' targeted educational programs, led by nephrologists, can effectively improve both the early identification and therapeutic management of CKD patients. However, CKD management remains suboptimal compared to guidelines' recommendations. These results underscore the need for a structured care pathway with a well-defined co-management approach, including timely referrals to nephrology clinics, particularly for patients at higher risk of progression. A structured approach is essential for optimizing therapeutic management in line with KDIGO guidelines, especially as effective treatment options are now available to slow disease progression and manage comorbidities. Ultimately, these interventions could contribute to reducing the long-term healthcare burden associated with CKD.

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