How to Use Costs in Value-Based Healthcare: Learning from Real-life Examples

Esmée K. J. van der Poort, MSc[1], Martha Kidanemariam, MD[1], Christopher Moriates, MD[2,3], Margot M. Rakers, MD[4,5], Joel Tsevat, MD, MPH[6], Marielle Schroijen, MD, PhD[7], Douwe E. Atsma, MD, PhD[8], M. Elske van den Akker-van Marle, PhD[1], Willem Jan W. Bos, MD, PhD[9,10], and Wilbert B. van den Hout, PhD[1]

[1]Department of Biomedical Data Sciences, Section of Medical Decision-Making, Leiden University Medical Center, Leiden, The Netherlands; [2]Department of Internal Medicine, Dell Medical School, University of Texas, Austin, TX, USA; [3]Department of Medical Education, Dell Medical School, University of Texas, Austin, TX, USA; [4]National eHealth Living Lab, Leiden University Medical Center, Leiden, The Netherlands; [5]Department of Public Health and Primary Care, Leiden University Medical Center, Leiden, The Netherlands; [6]Department of Medicine and ReACH Center, Joe R. & Teresa Lozano Long School of Medicine, University of Texas Health Science Center at San Antonio, San Antonio, TX, USA; [7]Department of Internal Medicine, Section of Endocrinology, Leiden University Medical Center, Leiden, The Netherlands; [8]Department of Cardiology, Leiden University Medical Center, Leiden, The Netherlands; [9]Department of Internal Medicine, Section of Nephrology, Leiden University Medical Center, Leiden, The Netherlands; [10]Department of Internal Medicine, St. Antonius Hospital, Nieuwegein, The Netherlands

ABSTRACT

BACKGROUND: Healthcare organizations measure costs for business operations but do not routinely incorporate costs in decision-making on the value of care.

AIM: Provide guidance on how to use costs in value-based healthcare (VBHC) delivery at different levels of the healthcare system.

SETTING AND PARTICIPANTS: Integrated practice units (IPUs) for diabetes mellitus (DM) and for acute myocardial infarction (AMI) at the Leiden University Medical Center and a collaboration of seven breast cancer IPUs of the Santeon group, all in the Netherlands.

PROGRAM DESCRIPTION AND EVALUATION: VBHC aims to optimize care delivery to the patient by understanding how costs relate to outcomes. At the level of shared decision-making between patient and clinician, yearly check-up consultations for DM type I were analyzed for patient-relevant costs. In benchmarking among providers, quantities of cost drivers for breast cancer care were assessed in scorecards. In continuous learning, cost-effectiveness analysis was compared with radar chart analysis to assess the value of telemonitoring in outpatient follow-up.

DISCUSSION: Costs vary among providers in healthcare, but also between provider and patient. The joint analysis of outcomes and costs using appropriate methods helps identify and optimize the aspects of care that drive desired outcomes and value.

KEY WORDS: value-based healthcare; costs; shared decision-making; continuous improvement; benchmarking

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INTRODUCTION

Due to the continuing rise in healthcare expenditure,[1] considering the costs of care is clearly relevant. Value-based healthcare (VBHC) is a management strategy that has been progressively implemented in healthcare to optimize value to the patient by considering both outcomes and costs. One of the fundamental ideas of VBHC is that healthcare organizations can redesign and incrementally improve care delivery by understanding how costs are related to outcomes.[2,3] Yet, VBHC still lacks robust methods for the joint analysis of outcomes and costs required to understand what drives value.[4,5] In practice, healthcare organizations do measure costs for business but do not routinely incorporate costs in decision-making on the value of care.[6–8] This article provides guidance on how to use costs in VBHC delivery at different levels of the healthcare system by learning from real-life examples from the Netherlands.

The strength of VBHC is that it aims to optimize patient-relevant outcomes for every unit of currency spent.[9] Attempting to optimize outcomes without other considerations could result in expending large amounts of scarce resources for a negligible improvement in outcomes, at the expense of more efficient uses. On the other hand, solely focusing on costs could mean skimping on healthcare services and cutting budgets at the expense of beneficial health outcomes for patients, resulting in lower quality of care. Here, costs should be distinguished from charges. Costs denote the resources required to deliver care whereas charges only reflect the (often arbitrary) price of healthcare services on medical bills.[8] VBHC aims to include all costs surrounding the full cycle of care of the patient.[9] Overall, value cannot be optimized when only outcomes or only costs are considered.

Since VBHC's introduction in 2006,[10] costs have not been included to the same extent as outcomes in VBHC implementation.[11] In the Netherlands, the government has devised a 5-year national strategy for

outcome-based healthcare to support transforming the Dutch health system towards VBHC.[12] This strategy applies measured outcome data at different levels of the healthcare system: in shared decision-making (SDM) between patient and clinician,[11,13,14] in continuous learning within an organization[15–17], and in benchmarking among providers.[6,18,19] Routine outcome measurement is also an important prerequisite for providers to obtain reimbursement for care provided under value- instead of volume-based payment methods.[20,21] While the main focus of VBHC implementation has been the improvement of health outcomes, best practices for the use of costs at these different levels have emerged in the Netherlands.

Previously, Tsevat and Moriates have pointed out that VBHC should learn from cost-effectiveness analysis (CEA) when it comes to the joint analysis of outcomes and costs.[5] CEA provides a formal assessment of the impact of medical interventions on costs and health effects to inform policy and clinical guidelines.[22,23] In certain European contexts, CEA mostly uses quality-adjusted life years (QALYs) to aggregate outcomes in calculating an incremental cost-effectiveness ratio (ICER) to facilitate decision-making in the trade-off between outcomes and costs. There are apparent similarities between the value equation and the ICER used in CEA, but the value equation leaves many elements that are clearly outlined in CEA open to interpretation. These standardized components for CEA can also guide the joint analysis of outcomes and costs in VBHC delivery and provide a framework for analysis (Table 1). This highlights that costs can be included in VBHC delivery according to different perspectives. Below, we present three examples of specific applications in VBHC that have emerged in the Netherlands: SDM between patient and clinician, benchmarking among providers, and continuous learning within an organization.

SHARED DECISION-MAKING BETWEEN PATIENT AND CLINICIAN: DISCUSSING COSTS WITH PATIENTS WITH TYPE 1 DIABETES

There is growing evidence that costs matter to patients' health choices and that patients benefit from discussing costs in SDM.[27] To incorporate costs from the patient perspective, all costs that matter to the patient — not just the costs of care delivery — should be considered. According to CEA, costs from the patient perspective include premiums, out-of-pocket expenses, lost productivity costs (inability to work during or due to treatment or illness), and travel costs (to and from the care provider).[28] As such, Leiden University Medical Center (LUMC), a university teaching hospital in the Netherlands, has adopted a structured consultation model in diabetes care.[29] This model focuses on both patients' life- and health-related factors, e.g., social context, which may involve financial hardship. It is standard practice to consider travel time and out-of-pocket costs in the patient-clinician interaction, especially since LUMC is a referral center for patients with rare types of diabetes, e.g., monogenic diabetes mellitus. Hence, patients can be referred from outside of the region, leading to long travel times and greater costs. An ongoing study at LUMC investigates the effects of a VBHC dashboard

Table 1 Standardized Components for the Joint Analysis of Outcomes and Costs in VBHC Delivery

Level	Patient	Provider	Among providers
Aim	Achieve high-value care based on what matters to patients	Incrementally improve the value of care	Learn from other healthcare providers
Application	Patient-clinician interaction, shared decision-making	Continuous learning and evaluation within an organization	Benchmarking within and among organizations
Perspective	Individual patient	Hospital, clinic, practice site, disease-specific	Hospital, disease-specific
Outcomes	Clinical outcomes, PROMs, PREMs	Clinical outcomes, PROMs, PREMs, quality, process, and performance indicators	Quality, process, and performance indicators
Costs	Premiums, out-of-pocket expenses, travel costs, patient time costs, lost earnings, and unemployment benefits	Resources used to deliver care, cost drivers	Resources used to deliver care, cost drivers
Valuation of costs	Patient financial toxicity surveys and other instruments	Costing methods such as TDABC	Costing methods such as TDABC
Comparator	Treatment options or "patients like me"	Own performance over time, between patient groups	Other providers
Time horizon	Short- and long-term	Cycles of 3–6 months	1 year
Standardization	None	Standardized outcome sets, e.g., by ICHOM [24,25]	Scorecards or registries, e.g., Dutch Institute for Clinical Auditing [19,26]
Analysis	Not aggregated	Both aggregated and not aggregated	Aggregated

PROMs, patient-reported outcome measures; *PREMs*, patient-reported experience measures; *TDABC*, time-driven activity-based costing; *ICHOM*, International Consortium for Health Outcomes Measurement

containing the consultation model.[30] In that study, consultations between participating patients and their endocrinologist or diabetes nurse specialist were audio-taped and showed that cost-related issues have been regularly discussed even before implementation of the VBHC dashboard (see Box 1).

Box 1 Quotes of types of patient costs discussed in yearly routine check-ups for patients with type 1 diabetes, recorded in an ongoing study (C = Clinician, P = Patient)

Coverage by health insurance and out-of-pocket costs

C1: "Yes, because there are other statins out there."
P1: "Yes, that's what the pharmacy said. Then I said: I am not a guinea pig. I have a medication that I can handle well and then I have to change. That there are other laws. I then spoke to the owner of the pharmacy, because I was quite angry. He said 'just pay €162 per box.'"
C2: "Yes, you have a BMI of 29.5, so you are not eligible for that reimbursement. […]Then you must have a BMI above 35." […]
P2: "But I could pay for it myself. If I avoid becoming blind, then I think it is worth having to pay €120 per month for it."
C3: "What we are talking about is called the Freestyle Libre [for HbA1c assessment, red.], that is only reimbursed with insulin [use]"
P3: "That is quite expensive"
C3: "That is quite expensive indeed"
P3: "I thought, it costs approximately €60 per 2 weeks."
C3: "But if I think along with you, you said, 'I would like to know my HbA1c more often.'" […]
C3: "What we could do is… A HbA1c assessment can also be done from home these days."

Productivity costs

P4: "For me, the trigger remains work, stress. Everything unravels after that."
C4: "Stress is most important."
P4: "Yes work pressure, so I am looking to sell my office and enter into employment somewhere … But it remains that work is actually the biggest negative factor. It makes me do all the other negative things too. If that becomes too much, I will sleep less, less sleep will make me hungry, hunger will make me eat wrong, wrong food will make me fatter. Then I become lethargic again, I feel less like moving. And it goes down and the sugar goes up."
C4: "Yes, you've got it all figured out, that's how it works."
P5: "Yes, I had a heart attack [date] and that has meant that I am temporarily on sick leave, so I do not experience any work stress. So the sugars have become a lot better. But I now also take into account what I eat, also because one of the risk factors is overweight."
C5: "No, and you said in the beginning: you don't have work stress now. Now you are rehabilitating, but I assume that at some point you will go back to work."
P5: "Yes."
C5: "Are you going to approach that differently?"
P5: "Yes, that really gave me a wake-up call. And stress is also one of the risk factors that I have to bring down […]."

Travel costs

P6: "I gave the lab results [from another lab] to the receptionist."
C6: "That seems okay, then we don't have to repeat that."
P6: "Yes, because getting blood drawn here takes me 2½ hours; coming here from home, that seems like a waste of time."

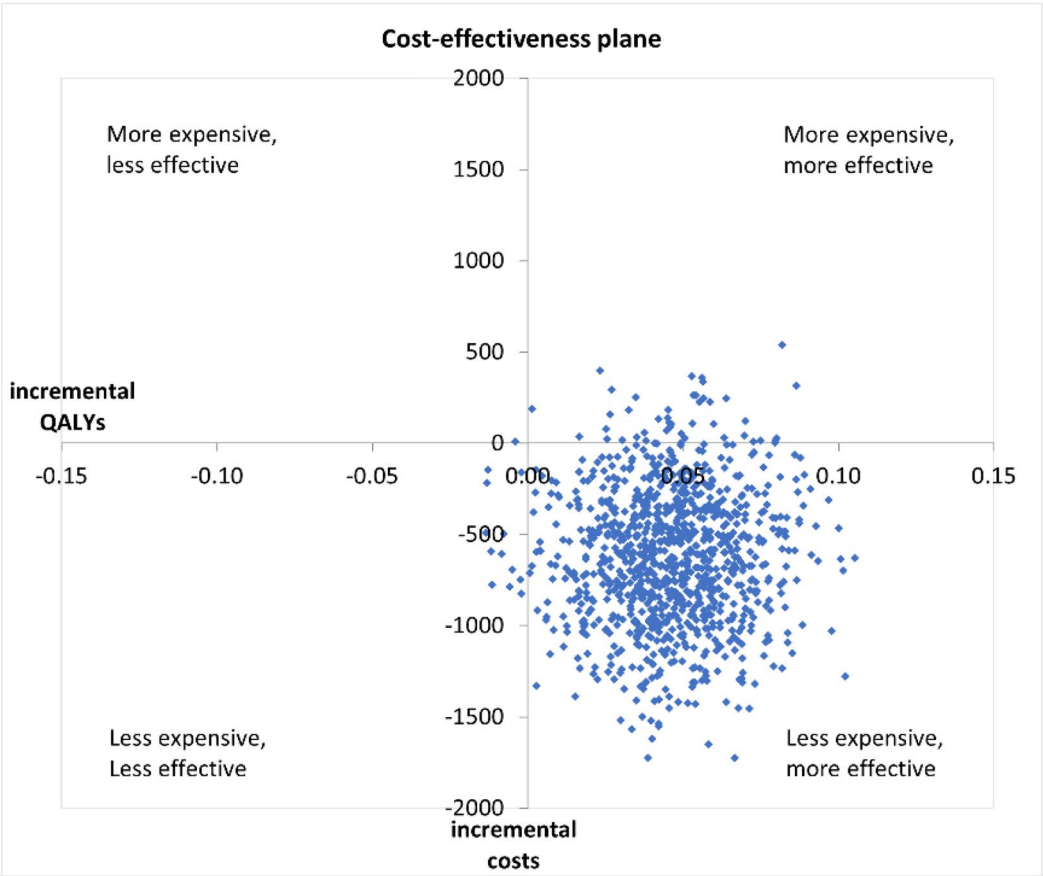
To optimize value at the individual level, both outcomes and costs from the patient perspective need to be considered in consultations, allowing patients and clinicians to explore and agree upon a fitting care plan. A systematic review by Witte and colleagues on financial toxicity after cancer diagnosis and treatment showed widespread recognition of financial burden, but measures that can assess patients' financial burden are lacking.[31] Recently, the Comprehensive Score for Financial Toxicity-Functional Assessment of Chronic Illness Therapy (COST-FACIT) was validated in a population of adults with diabetes and elevated HbA1c levels.[32] More research on patient-centered tools that support cost considerations in the patient-clinician interaction is needed.

BENCHMARKING AMONG PROVIDERS: OUTCOME AND COST INDICATORS IN BREAST CANCER CARE

Accurate costing in VBHC can be used to identify cost drivers, improve care pathways, evaluate those improvements, and facilitate benchmarking[33] and, therefore, is essential in VBHC. Cost measurement always consists of two parts: measuring quantities of resources and determining the value of these resources in unit costs or prices.[34] Benchmarking on costs can be challenging because it requires some form of uniform costing. One proposed approach for costing in VBHC is time-driven activity-based costing (TDABC),[35] but TDABC is resource-intensive to implement.[36] The Dutch Santeon group, a collaboration of seven independent large teaching hospitals, addresses this by using cost indicators — quantities of care activities that strongly impact the total costs of care — thus avoiding the need for uniform costing among hospitals.

Santeon benchmarks and learns from outcome, process, and cost indicators for specific medical conditions by incorporating semi-annual scorecards.[37] In a consensus process with different groups of care professionals, the scorecard outcome and process indicators are selected based on existing outcome sets.[38] Cost indicators are selected based on significant cost drivers in the integrated practice units.[6] In the case of breast cancer care, the set of cost indicators includes length of stay in number of days, the proportion of primary breast-conserving operations performed as same-day surgeries (without overnight hospitalization), operating room time per patient in minutes, number of consultations per patient, diagnostic tests per patient, and number of expensive drug prescriptions.

In advance, all Santeon hospitals had expected that 85% of patients would undergo same-day surgery, whereas the percentage was in fact only 56%.[39] Additional analyses showed that patients did not always know that same-day surgery was an option even though they might have preferred it. In addition, the high rate of morphine use in some hospitals resulted in nausea during hospitalizations. Since analysis of the scorecards, patient-clinician communication about outpatient treatment has improved and patients now receive a nerve block during surgery, rendering the use of morphine unnecessary. This resulted in 66% of patients undergoing same-day surgery. Here, fewer hospitalizations result in lower costs of care, which also drives better clinical and patient-relevant outcomes, together resulting in higher value.


Cost-effectiveness plane
More expensive, less effective
More expensive, more effective
Less expensive, Less effective
Less expensive, more effective
incremental QALYs
incremental costs
2000
1500
1000
500
0
-500
-1000
-1500
-2000
-0.15
-0.10
-0.05
0.00
0.05
0.10
0.15

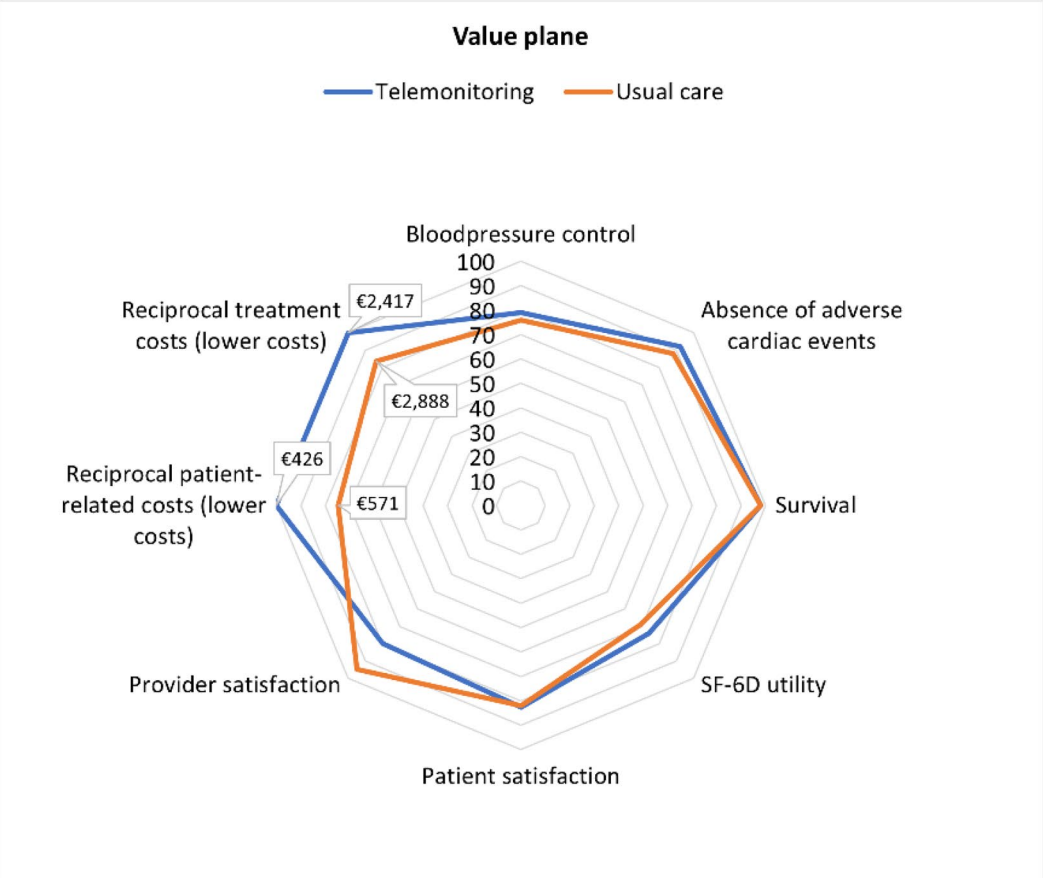

Value plane
Telemonitoring
Usual care
Bloodpressure control
Absence of adverse cardiac events
Survival
SF-6D utility
Patient satisfaction
Provider satisfaction
Reciprocal patient-related costs (lower costs)
Reciprocal treatment costs (lower costs)
€2,417
€2,888
€426
€571
100
90
80
70
60
50
40
30
20
10
0

Figure 1 A Cost-effectiveness plane from the trial-based CEA comparing telemonitoring with usual care. B Value plane presenting the assessed clinical and patient-relevant outcomes, experience measures, and costs. The costs are formatted as reciprocal costs so the outer value on the radar chart indicates favorable cost. Cost-effectiveness plane adapted from [41]. Copyright ©Roderick Willem Treskes, M Elske van den Akker-van Marle, Louise van Winden, Nicole van Keulen, Enno Tjeerd van der Velde, Saskia Beeres, Douwe Atsma, Martin Jan Schalij. Originally published in the Journal of Medical Internet Research (https://www.jmir.org), 25.04.2022.

CONTINUOUS LEARNING WITHIN AN ORGANIZATION: EVALUATION OF TELEMONITORING IN MYOCARDIAL INFARCTION CARE

Through VBHC implementation, healthcare organizations aim to incrementally improve care by a process of continuous learning based on collected outcome and cost data. Outpatient follow-up in the care pathway for acute myocardial infarction (AMI) at LUMC was redesigned by implementing telemonitoring for blood pressure (BP) regulation at home. Patients received smart technology devices, including a BP monitor, electrocardiogram device, scale, and activity tracker to measure clinical and patient-reported outcomes at home. Office follow-up visits at 1 and 6 months were replaced with electronic consultations.[40] LUMC initially evaluated the performance of the redesigned care pathway using a trial-based CEA from a department perspective with a threshold p-value < 0.05 for statistical significance. One year after its adoption, telemonitoring resulted in non-significant savings of €616 per patient (95% CI €133 to €1365; $p = 0.11$) and a statistically significant moderate gain of 0.05 QALYs (95% CI 0.01 to 0.09; $p = 0.03$) compared with usual care.[41] In the care pathway for AMI, telemonitoring is the dominant strategy because it is slightly more effective and less expensive than usual care, supporting the decision to adopt telemonitoring in the care pathway.

We used a radar chart analysis[42] to compare the various outcomes and costs of telemonitoring and usual care according to VBHC principles and contrasted this to CEA (Fig. 1). First, the cost-effectiveness plane shows that BP telemonitoring is both less expensive and more effective than usual care, i.e., telemonitoring is dominant in CEA terminology. Alternatively, the radar chart shows costs from the organizational and patient perspectives, disaggregated outcomes, and experience measures assessed from the patient perspective (e.g., through patient-reported experience measures) and clinical perspective, including BP control, absence of adverse cardiac events, survival, health utility based on the SF-6D measure, and patient and provider satisfaction.[40] For example, after 1 year, in the BP telemonitoring intervention group, 79% of patients had a systolic BP ≤ 139 mm Hg and a diastolic BP ≤ 89 mm Hg, as compared with 76% in the control group ($p = 0.64$). The radar chart shows lower costs and a slight increase in the SF-6D utility but worse provider satisfaction.

DISCUSSION

In VBHC, there is no uniform criterion for the trade-off in these outcomes and costs. Presentation of separate outcome and cost domains allows viewers to form their own conclusions and helps clarify the outcome and cost domains that drive the value of changes in care delivery. The examples presented in this paper and the framework for analysis (Table 1) illustrate opportunities for standardizing the use of outcomes and costs in VBHC. First, the VBHC community should be aware of the study perspective when including costs. Costs vary among providers in healthcare, but also between provider and patient. The costs relevant to patients with type 1 DM as discussed in a SDM framework move beyond the scope of the resources required to deliver care that are used in benchmarking in the second example. The burden of costs to the patient can be captured through survey instruments, e.g., for financial toxicity, suitable for the patient-clinician interaction. Second, insight into which costs drive the value of care may help design alternative payment models. Last, a certain uniformity in cost measurement should be established among healthcare organizations to facilitate the use of costs in VBHC delivery. At present, the different costing methods used in healthcare organizations complicate comparing costs among providers.

However, the examples also show that considering outcomes and costs jointly in VBHC in a meaningful way is already possible. In the patient-clinician interaction, discussion of both outcomes that matter to the patient and patient-relevant costs will help improve the value of care tailored to the individual. Among providers, best practices can be shared and adopted through benchmarking on outcomes and cost drivers. Within healthcare organizations, providers can incrementally improve care delivery by assessing both outcomes and costs in continuous learning and evaluation. Moving forward, costs should be appreciated as a necessary and useful component of VBHC on all levels of the healthcare system.

Corresponding Author: *Esmée K. J. van der Poort, MSc; Department of Biomedical Data Sciences, Section of Medical Decision-Making, Leiden University Medical Center, Leiden, The Netherlands (e-mail: e.k.j.van_der_poort@lumc.nl).*

Data Availability *Data is available upon reasonable request if study participant consent was provided.*

Declarations

Conflict of Interest *WJW Bos has received grants for research on related topics from ZonMW, the Dutch Kidney Foundation and Zilveren Kruis insurance, and is chair of the ICHOM working group for chronic kidney disease and member of committees of the Dutch Kid-*

ney FOundation and the Dutch quality initiative for nephrology. The other authors confirm they have no conflict of interests to declare.

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