Increased knowledge, by itself, does not automatically lead to adherence (48, 49). Improving drug therapy adherence relies on patient education, but one which goes beyond simply repeating instructions or providing printed materials. Indeed, a holistic approach is needed that includes gathering patient-specific information, customizing instructions, providing support, encouragement, monitoring and evaluating the patient's response to treatment to determine its effectiveness in improving patient outcomes (50). Medication non-adherence, including errors in administration such as incorrect use, is a major contributor to adverse drug reactions and hospitalizations. In particular, elderly patients with polypharmacy for chronic diseases are at the highest risk for such adverse drug reactions (51). Medication non-adherence has been documented as a contributing factor in over 20% of preventable adverse drug events (ADEs) in older patients in ambulatory care settings (52). Studies indicate that more than 10% of admissions of older adults to acute care can be attributed to non-adherence to medication regimens (53). Col et al. reported in their study that one-third of older persons admitted to hospital had a history of non-adherence (54).

Medication non-adherence is categorized as either intentional or unintentional. Intentional non-adherence involves a patient's active choice to not follow treatment, considering the pros and cons. In contrast, unintentional non-adherence is passive, often due to factors outside the patient's control. Intentional non-adherence is linked to a patient's beliefs and motivation, while unintentional non-adherence is reportedly more associated with demographic factors such as age (55).

Challenge to measure

Adherence to medications is the basic precondition of successful treatment of chronic diseases that require long-term use of medications (e. g., cardiovascular diseases, asthma, COPD). The recent increase in access to patient-level prescription and dispensing data in administrative records has created new possibilities for objectively measuring medication adherence at the population level (56). Nowadays, robust data extraction from prescription records or insurance databases is a valuable resource for analyzing medication-taking behavior, enabling retrospective analysis. This objective measure approach is particularly relevant in the context of chronic diseases and in cases involving polypharmacy. The advantages include a detailed analysis of adherence and persistence, understanding the impact of various factors on adherence, and simplified data access for population analysis (57). In a register-based retrospective cohort study, Wawruch et al. explored the factors influencing medication adherence in persistent angiotensin-converting enzyme inhibitors (ACEI) users and non-persistent ACEI users (n = 6,578). The most significant predictors of medication non-adherence were the use of mineralocorticoid receptor antagonists, bronchial asthma/COPD, and dementia, highlighting the complex interplay of comorbidities and medication regimens in influencing adherence. These findings emphasize the need for tailored approaches in managing such patients to improve medication adherence. The results of the study can help in determining the cohort of patients who require increased attention (58).

Non-adherence is commonly assessed using two key indexes: the Proportion of Days Covered (PDC) and the Medication Possession Ratio (MPR). The PDC is calculated by dividing the number of days covered by medication treatment by the number of days in the follow-up period, with a common threshold for non-adherence set at PDC < 80 % (57). To standardize and enhance the reporting accuracy for PDC, enabling more reliable comparisons across studies and health systems, Dalli et al. introduced the TEN-SPIDERS tool. This acronym stands for Threshold, Eligibility criteria, Numerator and denominator, Survival, Pre-supply, In-hospital supplies, Dosing information, Early Refills, and Switching. Each component of this tool provides specific guidelines for reporting PDC-related parameters (56). Similarly, the Medication Possession Ratio (MPR) generally indicates the percentage of days' supply received over a specified time. However, discrepancies in the MPR denominator definition can contribute to variations in research findings and complicate cross-study comparisons (59).

Digital databases are also useful in terms of researching primary medication non-adherence (PMN). PMN occurs when a patient fails to pick up a newly prescribed medication. A study by Bruthans et al. underscored the importance of considering age-related factors when addressing medication adherence issues. This research of electronic prescription database in the Czech Republic indicated that PMN varied significantly across age groups, with the highest rates observed in younger patients (18–39 years old) and the lowest in older patients (75 years and older). The study showed a PMN of 4.56 percent which is comparable with other studies on PMN (60–62). The approach and findings of the study contribute to a broader understanding of medication adherence, particularly in the context of electronic health records (60).

In clinical settings, it is vital to use self-report questionnaires for numerous reasons (e. g., for their being inexpensive, widely accepted, uncomplicated to use, non-invasive, and time-efficient). Importantly, the unique capability of self-reporting lies in its ability to both track medication use patterns and identify reasons for non-adherence. This underscores the necessity for an accessible tool that not only detects adherence issues in routine settings but also paves the way for effective adherence-improvement interventions. These interventions should be specifically targeted to the identified issues and personalized for the individual patient (63, 64). Therefore, focusing on patient-adjustable factors is essential in the assessment phase.

The extensive range of adherence measurements available in the existing literature complicates the process for healthcare providers in determining the most appropriate instrument for their clinical practice. In a secondary analysis of data by Kwan et al. (2020), a total of 121 unique instruments for measuring medication adherence were evaluated for their psychometric quality and evidence, following the COSMIN guidelines (65, 66). None of the instruments evaluated met the criteria for all nine key measurement properties. Cross-cultural validity was notably absent despite numerous translations. The study identified inadequately established psychometric properties for medication ad-