DUODECIM

Clinical Decision Support

White Paper
2026

DUODECIM
Clinical Decision Support

DUODECIM
EBMEDS

THE FINNISH MEDICAL SOCIETY
DUODECIM
PUBLISHING COMPANY

The Finnish Medical Society Duodecim is Finland’s largest scientific association. It exists to develop the professional skills and clinical practice of doctors through continuing education, publications and research grants. Established in 1881, Duodecim’s membership today comprises more than 20,000 doctors and medical students.

Duodecim Publishing Company Ltd is the leading medical publishing company in the Nordic countries. Duodecim Publishing Company Ltd publishes information content for medical and healthcare professionals in the form of traditional printed products but also as electronic databases, solutions integrated into healthcare systems and an online learning environment. It is owned by the Finnish Medical Society Duodecim

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EBMEDS Overview

EBMEDS combines patient data with current medical knowledge to deliver reliable, personalized guidance at every step.

Duodecim EBMEDS Is a Suite of Digital Services Designed to Guide Patient Care Throughout the Entire Care Pathway

By combining patient data with up-to-date medical knowledge, EBMEDS services delivers reliable, personalized guidance at every step. Our solutions integrate seamlessly with other healthcare systems, supporting both citizens and healthcare professionals. The result: safer care, better outcomes, and smarter decision-making for everyone involved — from the first signs of symptoms to effective treatment. .

Duodecim EBMEDS is a collection of digital services designed to improve the quality of care:

- **Clinical Decision Support**: Patient-specific guidance for healthcare professionals to support clinical decision-making.
- **Health Benefit Analysis:** Population-level analytics to optimize care pathways, with a strong emphasis on prevention and long-term outcomes.
- **Duodecim Star**: Low-threshold digital health checks and online coaching that help citizens prevent and manage lifestyle-related diseases.
- **Duodecim Symptom Checkers**: Citizen-facing tools that help assess the need for treatment and the urgency of individual health problems or symptoms.

Healthcare environment

Addressing information overload is essential to improving patient safety in modern healthcare.

Information Overload and Its Impact in Healthcare

The healthcare environment is becoming increasingly complex as medical knowledge, diagnostic tools, and treatment options expand rapidly. While this growth offers opportunities to improve patient outcomes, it also creates challenges for clinicians, who must sift through vast amounts of data to make timely, accurate decisions. Electronic health records (EHRs), though essential, can make it difficult to quickly identify the most relevant clinical information, increasing the risk of delays or oversights.

A major patient safety concern is abnormal test results that go unnoticed or are not followed up. Adverse drug reactions also remain a frequent cause of emergency visits and hospital admissions. Many of these harms could be prevented through careful medication selection, monitoring, discontinuation of unnecessary drugs, and dose adjustments for factors such as renal function.

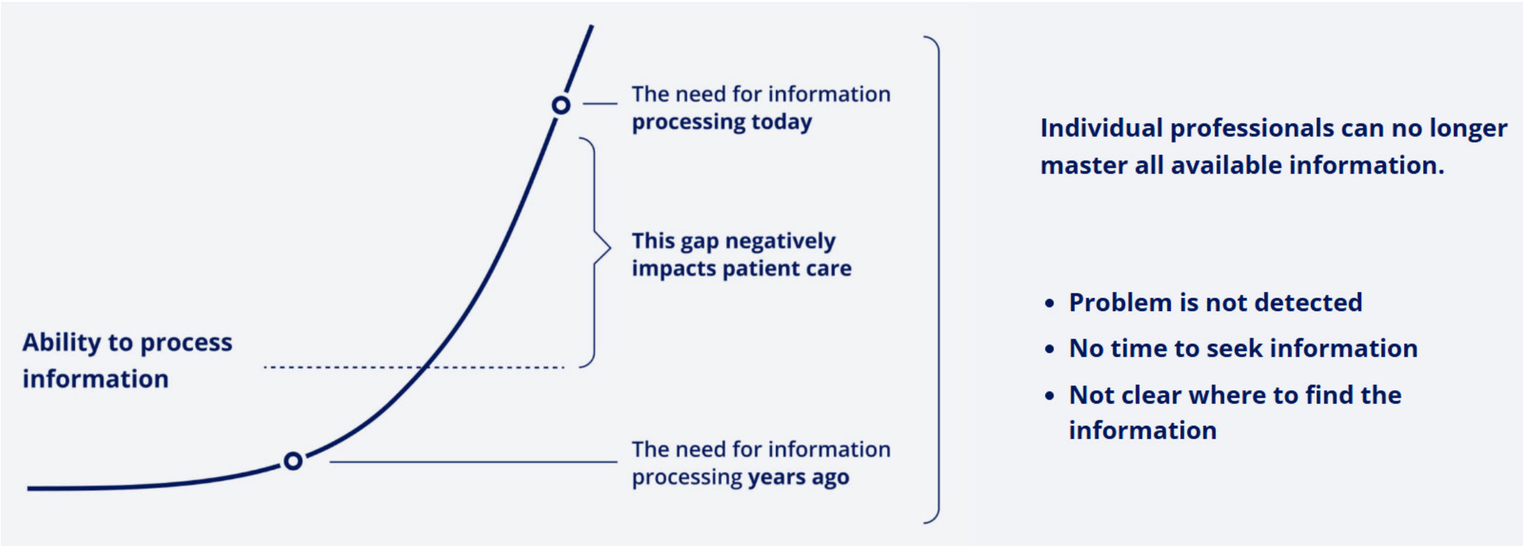
The impact of information overload is therefore significant and tangible. Clinicians face pressure to extract actionable insights efficiently within busy workflows. Without effective decision support, preventable harm increases, affecting patient safety and the overall quality of care.

Implementing tools that prioritize critical information, highlight potential risks, and support evidence-based decisions at the point of care can reduce cognitive burden and ensure important clinical signals are not missed, ultimately improving outcomes and patient safety.

Healthcare environment

With clinical decision support, healthcare organizations can turn data into decisions – and decisions into better care.

Information Overload and Its Impact in Healthcare



Clinical decision support integrated into electronic health records helps ensure that accurate information is available at the right time, in the right context, and in a useful format. This supports clinicians in following proper clinical processes and enables organizations to improve care quality, patient safety, efficiency, and cost-effectiveness.

Duodecim Clinical Decision Support

Duodecim Clinical Decision Support empowers healthcare professionals in delivering high-quality, consistent and more effective care.

Clinical Decision Support Improves Care Quality and Healthcare Efficiency

Research evidence demonstrates that evidence-based clinical decision support can improve patient outcomes, enhance the efficiency and accuracy of clinical decision-making, reduce medication-related risks and generate significant time and cost savings.



- Economic impact of EHR based CDS interventions especially with regard to reducing waste in healthcare is highly promising.
  - BMC Health Serv Res. 2020 Sep 15;20(1):871



- Use of an electronic decision support tool reduce polypharmacy
  - BMJ 2020;369:m1822



- Studies reported significant improvements in health outcome measures when using evidence-based clinical practice guidelines
  - BMJ Quality & Safety. 2009;18(5):385–392.



- Automated cardiovascular risk scores and patient-specific recommendations improve efficiency, accuracy and guideline adherence.
  - Appl Clin Inform. 2017 Feb 8;8(1):124–136



- 95% of Duodecim Clinical Decision Support users report time savings, reflecting improved workflow efficiency and high user satisfaction.
  - duodecim.fi/2026/04/14/

Duodecim Clinical Decision Support

Duodecim Clinical Decision Support delivers the latest medical knowledge to clinicians exactly when it matters most.

Improving Care Quality Through Integrated Duodecim Clinical Decision Support

Duodecim Clinical Decision Support is seamlessly integrated into electronic health record (EHR) systems, delivering intelligent, patient-specific guidance directly into clinical workflows. By analyzing structured health data and combining it with trusted medical knowledge and best-practice guidelines from multiple reliable sources, it empowers healthcare professionals to make informed decisions with confidence.

Designed for use across all healthcare roles, Duodecim Clinical Decision Support delivers timely recommendations at the point of care. Guidance can be generated automatically or on demand, ensuring continuous availability whenever clinical insight is needed. Always up to date, the system brings the latest medical knowledge to clinicians exactly when it matters most.

By keeping the patient at the center of care, it supports individualized treatment through clinically relevant alerts and personalized recommendations—clearly explaining what actions to take and how care should be adjusted.

By filtering out unnecessary notifications, Duodecim Clinical Decision Support helps reduce alert fatigue and cognitive overload. The result is safer decision-making, more efficient workflows, and higher-quality care for every patient.

Duodecim Clinical Decision Support

Duodecim Clinical Decision Support provides multiple benefits for professionals and organizations



More time for patient encounters

Easy access to accurate information and auto-filled forms and calculators cuts down time spent on searching and documentation – freeing up more time for patient care.



Cost savings through early identification of care gaps

Improved information access and usability help identify care gaps early, enabling proactive action. This leads to higher-quality care and longterm cost savings.



Consistency of care

When all professionals in an organization share the same up-to-date information in the same user-friendly format, the quality of care becomes consistent.



Individual and organizational learning

Comprehensive, continuously updated databases support ongoing learning and the development of professional skills at both individual and organizational levels.

Duodecim Clinical Decision Support

Clinical notes should actively inform care decisions and improve patient outcomes, not just be archived after the visit.

Relevant Patient Data as the Foundation of Duodecim Clinical Decision Support

Duodecim Clinical Decision Support uses basic clinically relevant patient data as input. The query generated by the electronic health record system contains a concise set of patient data, with irrelevant or outdated information filtered out.



Demographic information
- Age
- Gender



Diagnoses
- ICD-10 and ICPC-2



Interventions
- Medication
- Vaccinations
- Procedures



Measurements
- Laboratory results
- Physiological measurement



Factors that affect health
- Smoking
- Pregnancy



Risk information
- e.g., drug allergies

Duodecim Clinical Decision Support accommodates multiple coding systems, which are mapped to an internal alias system to ensure consistent interpretation of clinical data. It also allows the use of multiple measurement units, enabling seamless integration with diverse healthcare systems and workflows.

Duodecim Clinical Decision Support

Modular structure enables flexible, adaptable, and tailored installation.

Decision Support Rules

Patient data are analysed using clinical decision support rules implemented in JavaScript. These rules are created, managed, and updated using the web-based EBMEDS rule editor application, enabling efficient maintenance and continuous improvement of the rule set.

Modular Structure of Duodecim Clinical Decision Support

Duodecim Clinical Decision Support is organized into several independent modules that can be activated or omitted as required. Module selection is based on factors such as the availability, completeness, and quality of data in the underlying data repository, as well as any overlapping or existing functionality already provided by the electronic health record (EHR) system. This modular approach allows flexible deployment tailored to local needs and system capabilities.

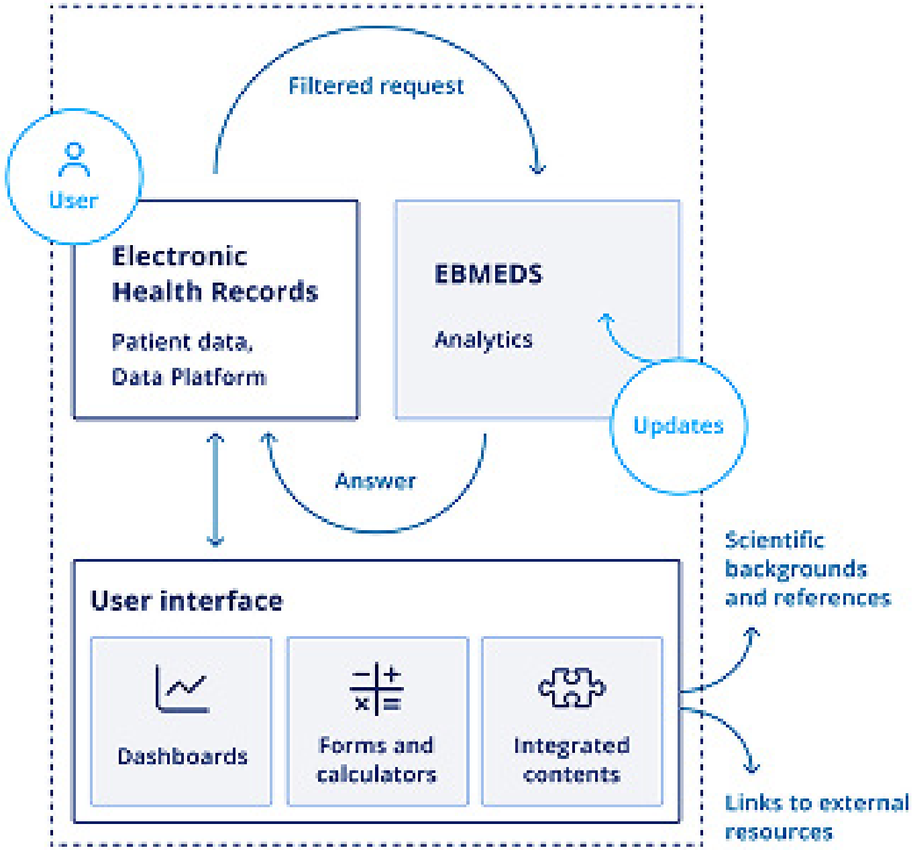
The modules primarily rely on data sources provided by Duodecim or approved third-party providers. When necessary, additional data sources can be introduced in collaboration with Duodecim, allowing the decision support functionality to be extended and adapted to specific clinical or organizational requirements.

Architecture and Integration

Duodecim Clinical Decision Support offers an API that works with any patient data repository containing structured patient data

API Integration and Data Sources

Duodecim Clinical Decision Support provides an API that can be consumed by any patient data repository that has access to structured patient data. The data repository is usually part of an EHR system, but it may also be an independent repository.



Architecture and Integration

The system has modest performance requirements and is fully horizontally scalable.

Data Transformation and Client Components

Before analysis, patient data must be converted into a format supported by the decision support engine. This is achieved through a lightweight adapter layer and client component developed by local IT teams familiar with the structure of the data repository.

The client component submits the data for analysis, receives and parses the response, and presents the resulting feedback within the EHR or data repository user interface. The decision support system itself has no user interface and returns only structured output for display by external systems.

Supported request message formats include native XML and JSON schemas, as well as initial support for FHIR STU3/R4, with broader FHIR compatibility planned as the standard continues to evolve

Performance and Deployment models

The system has modest performance requirements, is fully horizontally scalable, and can handle high server loads. Most patient datasets are processed in under one second.

Deployment is flexible and can be implemented either as a local installation or as a centralized service serving multiple organizations.

Duodecim Clinical Decision Support Modules

Reminders highlight when an individual patient’s care requires attention

1. Clinical Reminders

Clinical reminders help healthcare professionals identify and address important care needs, such as recommended tests, follow-ups, and preventive measures. A triggered reminder typically indicates a potential care gap, safety concern, or deviation from recommended clinical practice. Every reminder is linked to evidence-based information.

Reminders are tailored to each patient’s health status, clinical data, and care needs, highlighting what matters most while minimizing unnecessary interruptions and alert fatigue. Reminders are categorized into three levels according to their clinical significance, helping professionals prioritize actions.

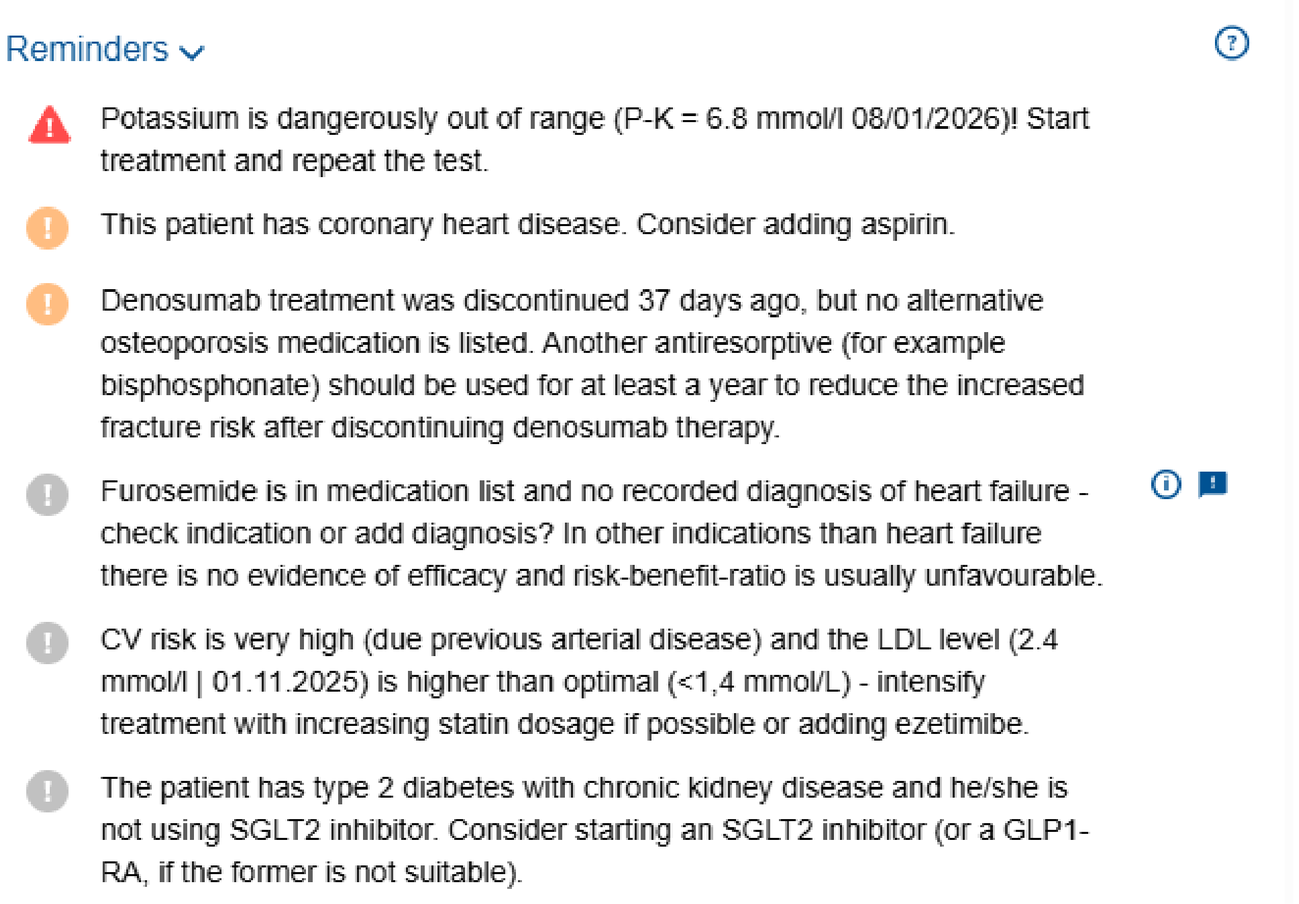
With CDS Hook support, clinical reminders can also be integrated more deeply into clinical workflows, enabling relevant information to be delivered at the right point in the care process.

By clicking a reminder, professionals can access relevant clinical guidelines and evidence through Smart Search or DuoAI, bringing trusted knowledge directly to the point of care.

Duodecim Clinical Decision Support Modules

Reminders are prioritized based on clinical importance and urgency

1. Clinical Reminders



Duodecim Clinical Decision Support Modules

Reliable guidelines support safe and consistent clinical decisions

2. Integrated Guidelines with AI support

Clinical guidelines support safe and consistent clinical decision-making. They improve patient outcomes while helping healthcare professionals stay up to date with best practices and the latest medical evidence.

Duodecim offers an extensive range of clinical guidelines and databases grounded in the latest medical evidence, expert-reviewed knowledge, and international collaboration. Our content is primarily produced in Finnish, our native language, with selected resources translated into several languages. In addition to Duodecim's own content local and international guideline collections can also be integrated to meet specific needs.

Duodecim Clinical Decision Support aims to integrate guidelines use even more seamlessly into clinicians' workflows. Today, healthcare professionals can search for clinical guidelines directly within the EHR by entering a search term or clicking Clinical Decision Support reminder, which is automatically converted into a search query.

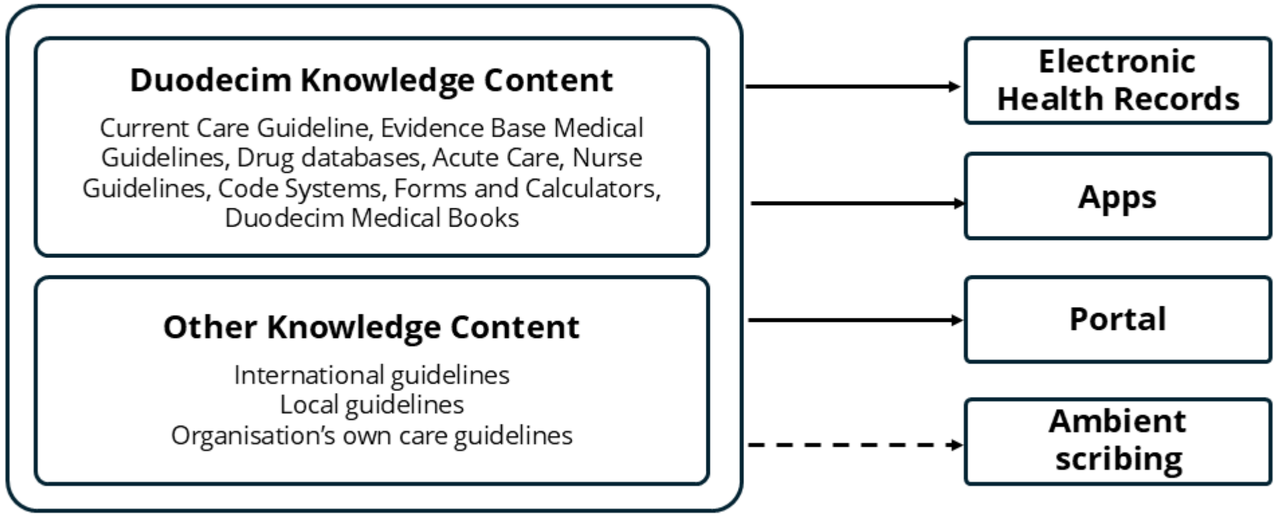
Smart Search uses vector search to identify the most relevant clinical guidelines and takes users directly to the most relevant sections. Users can quickly review the highlighted content or open the full guideline in its original format.

Duodecim AI takes clinical insight a step further by using generative AI to answer clinical questions based on high-quality, trusted medical databases.

Duodecim Clinical Decision Support Modules

Duodecim Clinical Decision Support integrates guidelines seamlessly into clinicians' workflows.

2. Integrated Guidelines with AI support



Looking ahead, the aim is to make DuoAI searches more context-aware by taking into account the patient's clinical data and the context in which the search is performed. Integrated with ambient scribing, DuoAI could retrieve relevant clinical guidelines and verify medical information in real time as documentation is generated, supporting informed, evidence-based decisions.

These capabilities will be introduced when MDR assessment and applicable EU AI Act requirements are completed.

Duodecim Clinical Decision Support Modules

Duodecim Clinical Decision Support calculators are based on validated research and are commonly part of clinical guidelines

3. Forms and Calculators

Clinical calculators help healthcare professionals assess disease risk, evaluate clinical findings, and support treatment decisions. They make complex assessments faster and more consistent, supporting evidence-based care in everyday practice.

Duodecim Clinical Decision Support offers a wide range of clinically relevant, validated calculators for different purposes, from risk assessment to clinical scoring and treatment planning. Calculators are MDR-certified where required, ensuring compliance with applicable medical device regulations.

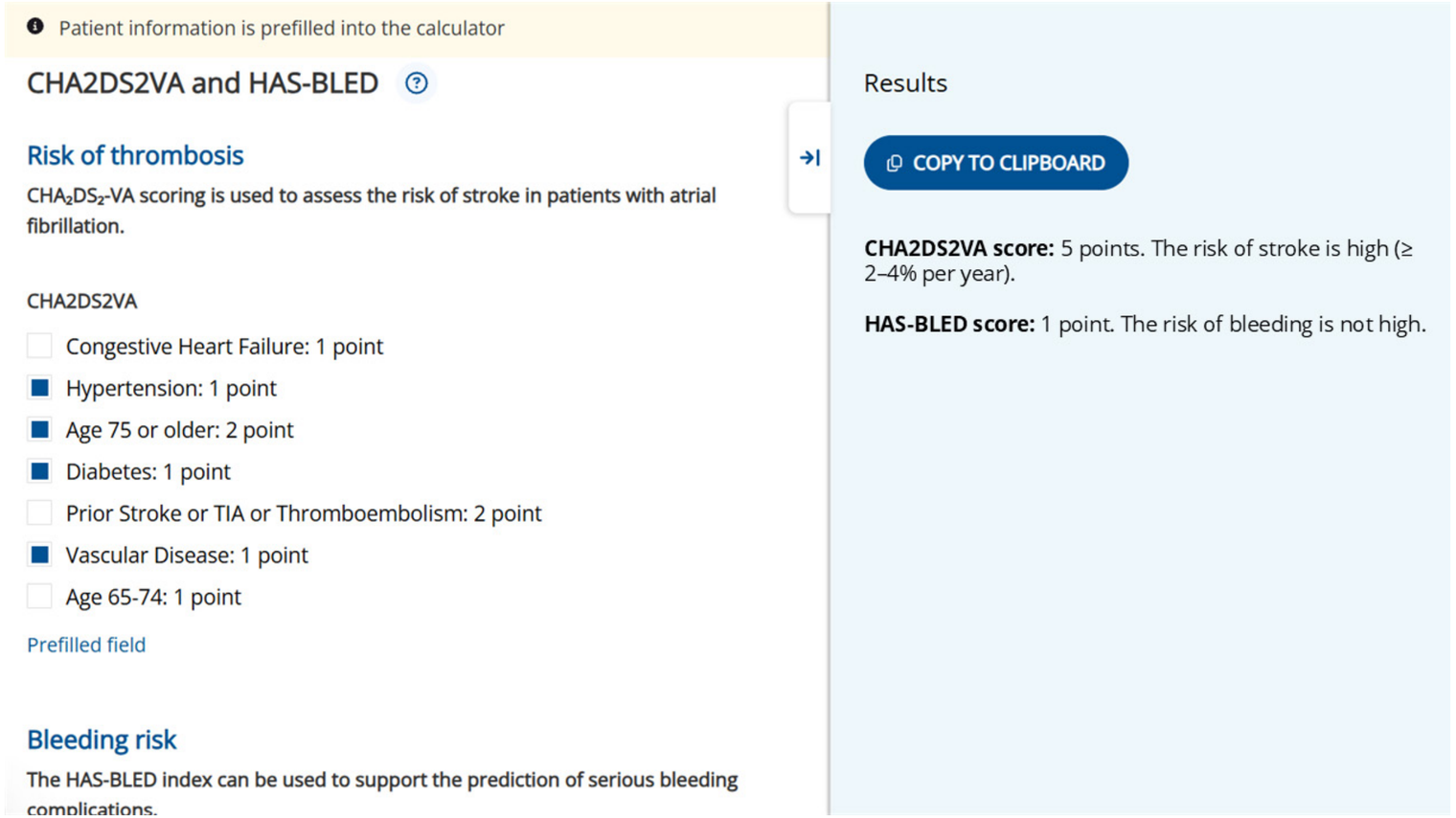
Duodecim Forms and Calculators are automatically pre-filled with available patient data from the EHR, saving time and reducing manual work. Healthcare professionals can review, complete, or modify the information as needed. FHIR-based integration enables data exchange between the EHR and calculators in both directions, supporting seamless workflows and documentation.

The same forms and calculators can also be made available through patient portals, allowing patients to complete them before an appointment and share the results with healthcare professionals in advance. This helps ensure that relevant information is available for the consultation and supports more efficient use of appointment time.

Duodecim Clinical Decision Support Modules

FHIR integration enables seamless data exchange between the EHR and calculators

3. Forms and Calculators



Duodecim Clinical Decision Support Modules

Duodecim Clinical Decision Support analyzes medication data along with other patient information to deliver timely, patient-specific clinical insights.

4. Drug databases

Drug databases play a vital role in healthcare by providing structured, reliable, and continuously updated medication information. They help healthcare professionals make informed decisions about drug selection, dosing, and safety. By identifying potential drug–drug interactions, contraindications, allergies, and duplicate therapies, they support medication safety, reduce the risk of errors, and improve the quality of care. When combined with pharmacogenomic information, drug databases can also support personalized drug and dose selection, enabling safer and more effective treatment.

Duodecim Clinical Decision Support takes this a step further by combining medication information with patient-specific data from electronic health records, including diagnoses and laboratory results. By analyzing this information against multiple drug databases, it provides timely, relevant clinical insights tailored to each patient's individual situation.

Structured, FHIR-compatible medical databases can be seamlessly integrated into EHRs and clinical workflows.

This integrated approach helps healthcare professionals identify medication-related risks early, optimize treatment choices, and make safer, more personalized decisions at the point of care.

Duodecim Clinical Decision Support Modules

Drug databases reduce medication errors and enhance patient safety

4. Drug databases

Adverse drug reactions

Total risk	D Anticholinergic effect	D Constipation	C Orthostatism	C Sodium balance	A Potassiu balance
amitriptyline	+ 3	+ 2	+ 3	-2	0
bisoprolol	0	+ 1	0	0	+ 1
furosemide	0	+ 1	0	-2	-2
losartan	0	0	0	0	+ 2
metformin	0	0	0	0	0
rosuvastatin	0	+ 1	0	0	0

User Interface

Duodecim Clinical Decision Support brings evidence-based, patient-specific insights straight into clinical workflows

Structured Feedback

Electronic health record system can make use of the structured feedback provided by Clinical Decision Support. This means that the electronic health record system itself creates a user interface for the Duodecim Clinical Decision Support and displays the feedback it produces in a format suitable for the system. In principle electronic health record system may also choose to use only part of the Duodecim Clinical Decision Support feedback during different workflow stages.

Duodecim Clinical Decision Support summary page

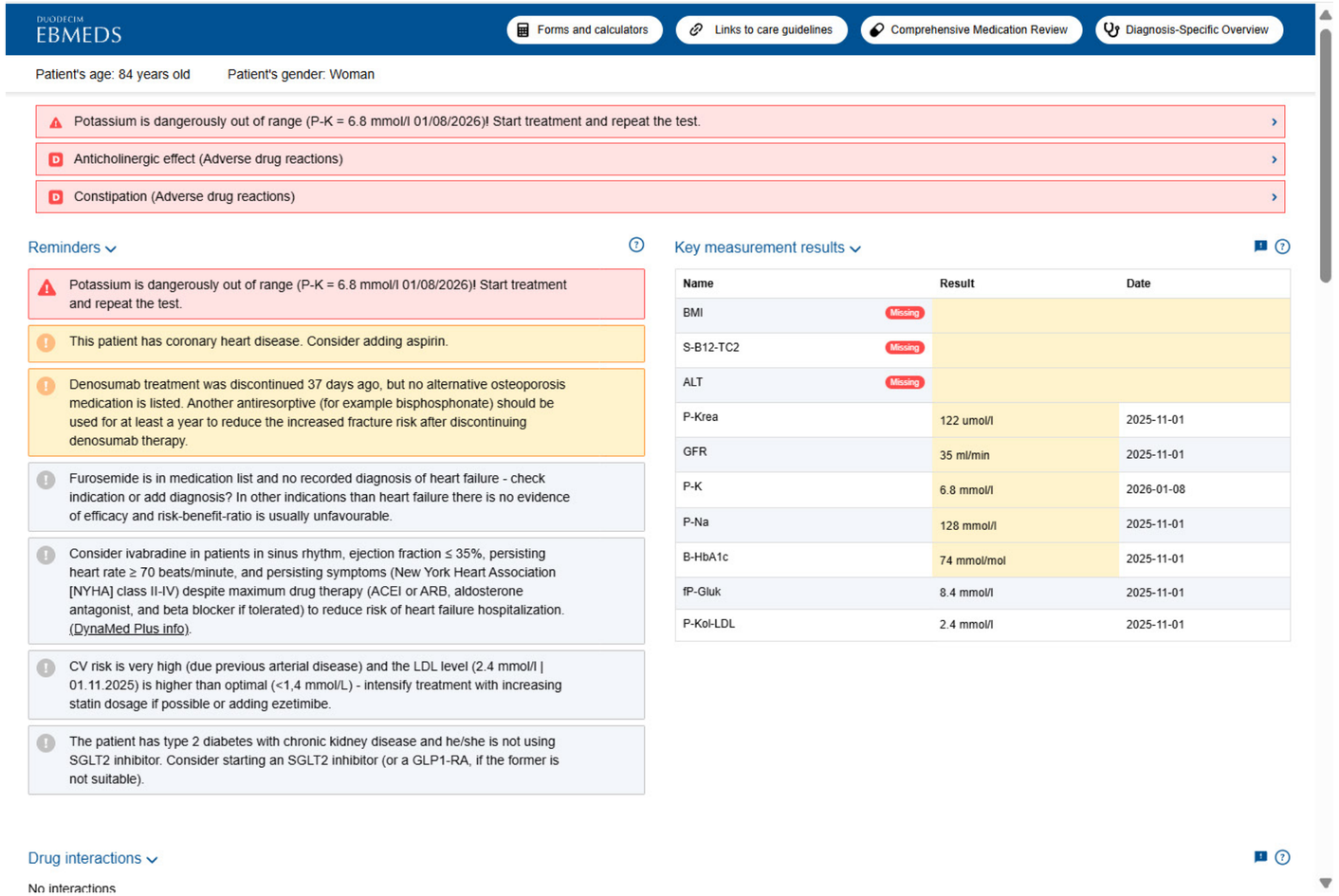
Summary page serves as a centralized patient overview, displaying essential information such as clinical reminders, drug-related alerts, and relevant laboratory results in one place. This reduces the need for healthcare professionals to navigate multiple sections of the EHR, saving time and improving workflow efficiency.

In addition to providing a clear snapshot of the patient's health status, the summary page supports clinical decision-making by enabling faster and more accurate treatment choices. It also offers quick access to additional resources provided by Duodecim Clinical Decision Support, which further enhances medication safety and ensures evidence-based care.

User Interface

A clear overview of key patient-spesific information with quick access to other Duodecim Clinical Decision Support tools and resources

Duodecim Clinical Decision Support summary page



User Interface

Duodecim Clinical Decision Support generates alerts to support safe medication use.

Duodecim Comprehensive Medication Review

Comprehensive Medication Review enables the evaluation of a patient's medication at a glance. Information that would otherwise need to be retrieved from several different sources is made quickly and easily accessible.

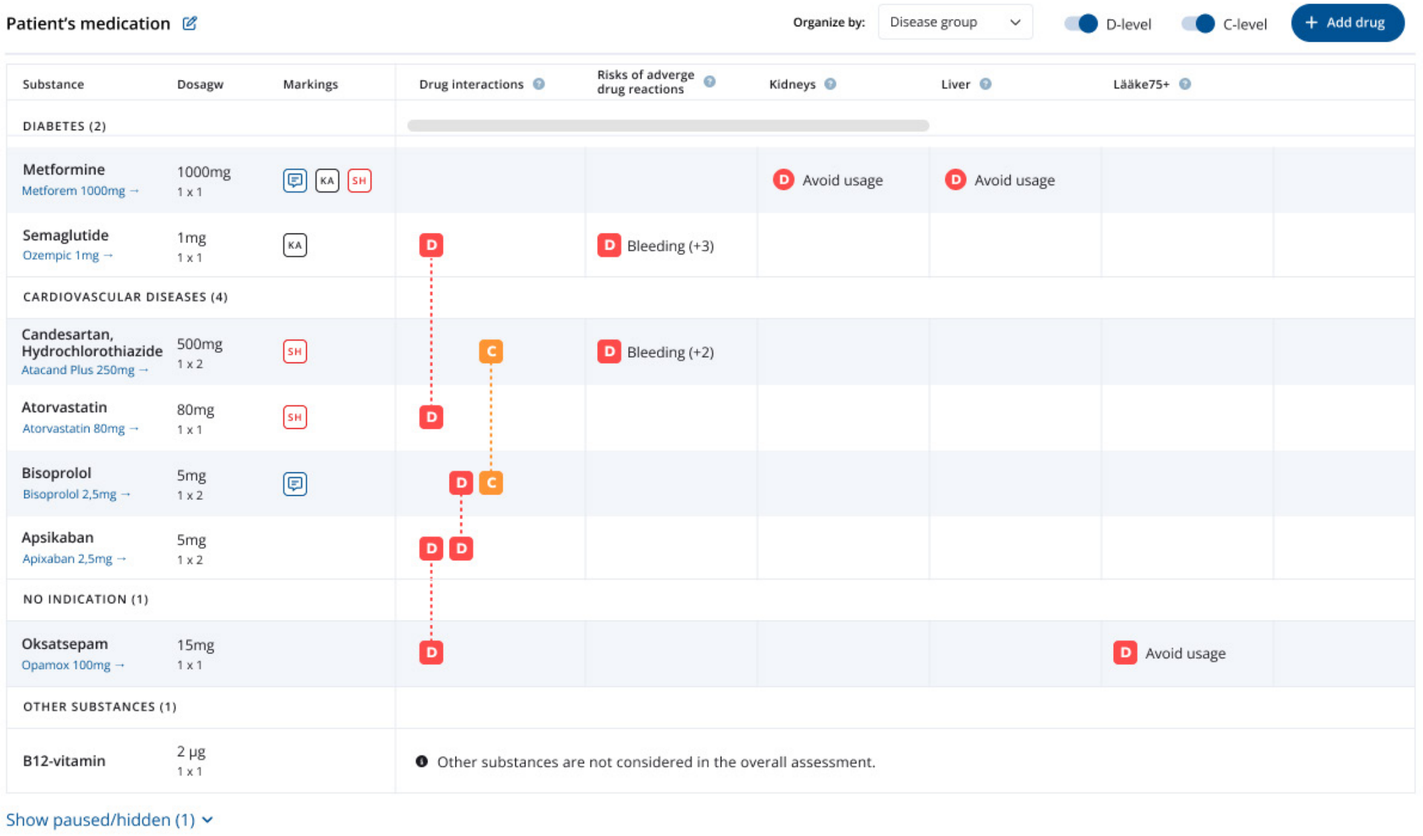
In addition to medication, the Comprehensive Medication Review also takes into account the patient's diagnoses and laboratory results, among other things. Medication can pose risks to a patient, but so can an untreated condition. Clinicians therefore need solutions tailored to the specific needs of each individual patient, not just a list of medication-related risks.

This helps identify medication-related problems and supports better decision-making in pharmacotherapy, improving medication safety while also saving the clinician's time.

User Interface

A clear Medication Overview presents essential medication information at a glance, enabling fast, informed clinical decisions.

Duodecim Comprehensive Medication Review



EBMEDS Quality Process

Reliable medical knowledge are at the core of our products clinicians can trust

Clinical Expertise Behind the Knowledge

All Duodecim EBMEDS contents is created, reviewed, and continuously maintained by medical professionals, ensuring it is scientifically sound, clinically relevant, and aligned with real-world medical practice. This expert-led approach allows users to rely on the information with confidence.

The EBMEDS editorial team consists of medical professionals from diverse clinical backgrounds. The team collaborates closely with the editorial teams of Duodecim guidelines and databases as well as with leading international partners. These include the Cochrane community, known for producing systematic literature reviews; the GRADE Working Group, which develops methods for assessing the quality of evidence and strength of recommendations; and the Guidelines International Network (GIN), a global organization dedicated to advancing clinical guidelines.

We are committed to delivering clinically meaningful and actionable information that supports healthcare professionals in making informed decisions. Our focus is on providing clear, concise, and relevant insights that can be directly applied in everyday clinical practice. Whenever customers have needs for new content or wants to accommodate existing content to local needs, our expert team is ready to assist

EBMEDS
Quality Process

Quality and seamless usability come together to create a user experience clinicians can trust

Quality drives everything we do

Quality is the foundation of everything we do. From the way we develop our products to how we support our customers, quality and continuous improvement guide every decision and every process. We are deeply committed to maintaining the highest standards to ensure reliability, safety, and trust in all our solutions.

Seamless and Intuitive User Experience

By combining modern technology with clear, user-friendly information, we create a seamless and efficient user experience. This enables our customers to work faster, with greater confidence and accuracy, leading to high levels of satisfaction and long-term partnerships.

EBMEDS Quality Process

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The device is produced by Duodecim Publishing Company Ltd.

The quality management system is certified in accordance with the requirements of ISO 13485:2016

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Summary of Intended Use

Duodecim Clinical Decision Support is a medical clinical decision support system that analyses structured patient data related to an individual's health and illnesses. It combines patient data with medical knowledge and practices from multiple sources. The purpose of the clinical decision support is to improve the quality of care and compliance with clinical guidelines, prevent treatment errors, improve patient safety and save the user's time.

Duodecim Clinical Decision Support is designed to provide clinical decision support such as treatment suggestions and diagnostic assistance for healthcare professionals. Typically, Duodecim Clinical Decision Support is connected to another information system that can produce the required structured patient information. Duodecim Clinical Decision Support is designed to be always available to the end user and to generate suggestions both automatically and upon the user's request. The software can be used for all types of patients regardless of age, gender or status of health.

Certified as a medical device

EBMEDS® Clinical Decision Support, hereinafter referred to as Duodecim Clinical Decision Support, is a Class IIa medical device in accordance with the EU Medical Device Regulation 2017/745.

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