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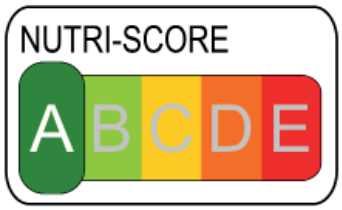
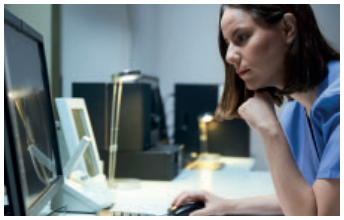
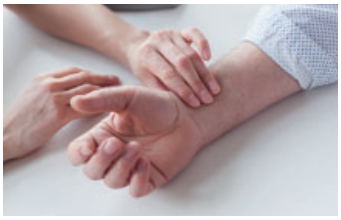


Nutritional profiling system score and mortality p 353



Impact of clinical decision support systems in processes of care p 354



Detection of atrial fibrillation through opportunistic screening p 356

ORIGINAL RESEARCH EPIC cohort study in 10 European countries

Association between nutritional profiles of foods underlying Nutri-Score front-of-pack labels and mortality

Deschasaux M, Huybrechts I, Julia C, et al

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Study question What is the association between the Food Standards Agency nutrient profiling system (FSAm-NPS), which grades the nutritional quality of food products and underlies the Nutri-Score front-of-pack label, and mortality in a multinational cohort?

Methods 501 594 adults from the European Prospective Investigation into Cancer and Nutrition (EPIC) cohort in 10 European countries were included in the analyses. Usual food intakes were determined with country specific diet assessment methods. The FSAm-NPS was calculated for each food item using its 100 g content in terms of energy, sugars, saturated fatty acids, sodium, fibre, and protein, and of fruit, vegetables, legumes, and nuts. The FSAm-NPS dietary index score was calculated for each individual as an energy weighted mean of the FSAm-NPS score of all foods consumed. The higher the FSAm-NPS dietary index score, the lower the overall nutritional quality of the diet. The associations between the FSAm-NPS dietary index score and all cause and cause specific mortality were assessed using multivariable adjusted Cox proportional hazards regression models.

Study answer and limitations Those with a higher FSAm-NPS dietary index score (lower nutritional diet quality) showed an increased risk of all cause mortality (n=53 112 events from non-external causes; hazard ratio for highest *v* lowest fifth 1.07, 95% confidence interval 1.03 to 1.10, P<0.001 for trend) and mortality from cancer (1.08, 1.03 to 1.13, P<0.001 for trend) and diseases of the circulatory (1.04, 0.98 to 1.11, P=0.06 for trend), respiratory (1.39, 1.22 to 1.59, P<0.001), and digestive (1.22, 1.02 to 1.45, P=0.03 for trend) systems. The age standardised absolute rates for all cause mortality per 10 000 people over 10 years were 760 (men=1237; women=563) for those in the highest fifth of the FSAm-NPS dietary index score and 661 (men=1008; women=518) for those in the lowest fifth. These results were obtained from an observational study using self-reported dietary intakes. Therefore, despite the robustness, consistency, and plausibility of the findings, misclassifications and residual confounding cannot be ruled out.

What this study adds In this large multinational European cohort, consuming foods with a higher FSAm-NPS score (lower nutritional quality) was associated with a higher mortality for all causes and for cancer and diseases of the circulatory, respiratory, and digestive systems, supporting the relevance of FSAm-NPS to characterise healthier food choices in the context of public health policies (eg, the Nutri-Score) for European populations.

Funding, competing interests, and data sharing See full paper on bmj.com for details of funding and competing interests. Information on submitting an application for access to EPIC data or biospecimens is available at https://epic.iarc.fr/access/index.php.

Associations between the FSAm-NPS dietary index (continuous, per 1 SD increment) and mortality (all cause and cause specific), from multivariable Cox proportional hazards regression models, European Prospective Investigation into Cancer and Nutrition cohort, 1992-2015

Causes of death	No with event/person years	Hazard ratio (95% CI)	P value
All causes:	54 951/8 162 730	1.02 (1.01 to 1.03)	<0.001
Non-external	53 112/8 162 730	1.03 (1.02 to 1.04)	<0.001
External	1839/7 783 132	1.00 (0.95 to 1.05)	0.93
Cause specific:			
Cancer	23 143/7 783 132	1.03 (1.01 to 1.04)	<0.001
Diseases of circulatory system	13 246/7 783 132	1.02 (1.00 to 1.04)	0.03
Diseases of respiratory system	2857/7 783 132	1.11 (1.06 to 1.15)	<0.001
Diseases of digestive system	1561/7 783 132	1.08 (1.02 to 1.14)	0.01

How effective are clinical decision support systems?

ORIGINAL RESEARCH Meta-analysis of controlled clinical trials

Computerised clinical decision support systems and absolute improvements in care

Kwan JL, Lo L, Ferguson J, et al

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Find this at: http://dx.doi.org/10.1136/bmj.m3216

Study question What is the typical improvement in processes of care—and thus the potential for clinical impact—conferred by clinical decision support systems delivered at the point of care?

Methods A systematic review and meta-analysis was carried out. Medline was searched up to August 2019. Randomised or quasi-randomised controlled trials reporting absolute improvements in the percentage of patients receiving care recommended by a clinical decision support system were included. Multilevel meta-analysis accounted for within study clustering. Meta-regression was used to assess the degree to which features of a clinical decision support system and study characteristics reduced heterogeneity in effect sizes.

Study answer and limitations In 108 studies (94 randomised, 14 quasi-randomised), reporting 122 trials involving 1 203 053 patients and 10 790 providers, clinical decision support systems increased the proportion of patients receiving desired care by 5.8% (95% confidence interval 4.0% to 7.6%). This pooled effect exhibited substantial heterogeneity (I^2=76%), with the top fourth of reported improvements ranging from 10% to 62%. Two study characteristics (low baseline adherence and paediatric settings) were associated with significantly larger effects. Inclusion of these covariates in the multivariable meta-regression, however, did not reduce heterogeneity.

COMMENTARY Current performance is disappointing, we should change direction

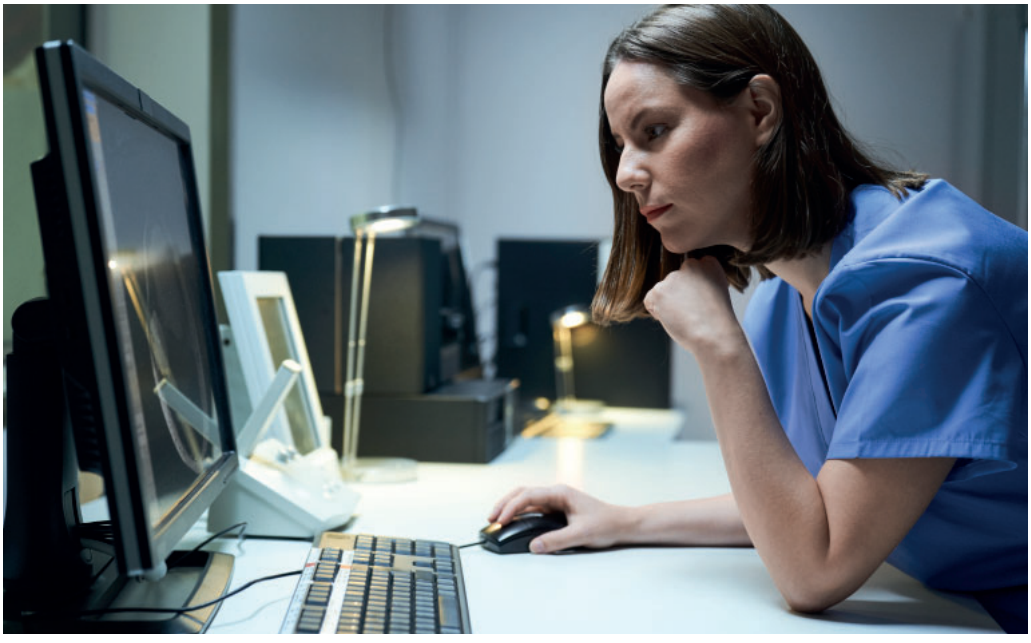
The meta-analysis by Kwan and colleagues of 122 trials of clinical decision support systems embedded in electronic health records shows modest improvements in care processes overall, with widely varying effects among trials.[1] The authors found no significant improvement in clinical outcomes in the subset of 30 trials that included them.

The disappointing performance of decision support systems embedded within electronic health records suggests it is time to change our approach. This lack of efficacy likely reflects the challenges of developing innovative, safe, and effective clinical decision support systems within commercial electronic health record platforms. First, well documented problems with usability[2 3] and widespread dissatisfaction among clinicians using[4] electronic health records might be a barrier to effective clinical decision support. Second, the underlying software architecture of electronic health records constrains options for the design of clinical decision support systems[5] and might not be the best site for innovative approaches.[6]

Finally, individual companies have created their own "language" for data within electronic health records—such as identifiers for drugs—which differs from internationally accepted standards.[7 8] This lack of consistency means that independent clinical experts need to "learn the language" for each electronic health record platform in order to develop decision support within it. This creates a barrier to development, particularly development across different platforms.

Bolt on systems

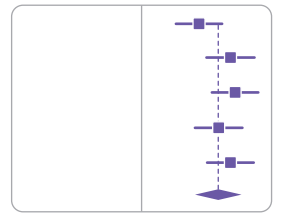
Decision support systems are often designed to "bolt on" to the electronic health record.



What this study adds Most interventions with clinical decision support systems appear to achieve small to moderate improvements in targeted processes of care. A minority of studies achieved substantial increases in the delivery of recommended care; predictors of these more meaningful improvements remain undefined.

Funding, competing interests, and data sharing The authors report no relevant funding. No competing interests. No additional data are available.

Type of outcome	No of trials	Total No of patients (%)	Total No of providers (%)	Multilevel meta-analysis (95% CI)	Multilevel meta-analysis (95% CI)
Prescribing	68	731 726 (61)	7 977 (74)		4.4 (2.6 to 6.2)
Test ordering	30	372 640 (31)	2 783 (26)		6.8 (4.9 to 8.6)
Documentation	25	403 161 (34)	1 327 (12)		7.1 (5.4 to 8.9)
Vaccination	12	75 731 (6)	137 (1)		5.9 (4.1 to 7.7)
Other*	35	391 959 (33)	2 497 (23)		6.8 (5.0 to 8.6)
All	122	1 203 053 (100)	10 790 (100)		5.8 (4.0 to 7.6)



Absolute improvements in desired care by different categories of clinical care

These third party applications typically retrieve data from the record and, in some cases, send recommendations back to clinicians through the same route. These bolt on systems are an important component of the current clinical decision support systems landscape but were excluded from Kwan and colleagues' meta-analysis.

Third party decision support applications might be more effective than the embedded approaches they evaluated and further research should be done to explore this possibility.

This study still has important implications. First, the premise that clinical decision support systems alone will improve clinical care should be re-examined. In the outpatient setting, where most of the included trials occurred, there are many substantial barriers to providing guideline recommended care. Reminders to clinicians in the form of decision support systems might not address issues such as the lack of time for preventive care,[9] the greater efficacy of preventive care when delivered through population approaches, and the need for non-physician healthcare workers to participate in preventive care tasks.[10]

Patient engagement is critical to high quality care in outpatient settings and has not been a focus of clinical decision support systems to date.[11] Systems typically do not address the need for patient participation, such as attendance for appointments or adherence to management recommendations. Clinical decision support systems should be considered only one part of an integrated approach to closing quality gaps in medical care, rather than a standalone solution.

We recommend a multifaceted strategy to enhance the effectiveness of clinical decision support systems in practice. First, vendors should remove barriers to creating, implementing, and sharing clinical decision support systems approaches that can be integrated within electronic health records so that the most usable, feasible, and effective solutions can be identified and scaled up.

Design should arise from a multidisciplinary understanding of clinician and team workflows

Second, the design should arise from a collaborative, multidisciplinary, understanding of clinician and team workflows, informed by human factors engineering. Third, implementation of decision support systems must occur alongside co-interventions to influence clinicians' behaviour. Strategies such as clinician education and training and behavioural "nudges" such as default orders for recommended care options should be tested during implementation.

Fourth, further research is needed to integrate decision support systems with patient engagement strategies ranging from education and shared decision making aids to self-scheduling.

Fifth, these systems can and should evolve, using machine learning and artificial intelligence, to develop tailored and relevant decision support that minimise alert fatigue.

Evaluation of clinical decision support systems should include context specific implementation measurements, such as the number of dismissed alerts, the time required to address recommendations, and clinician satisfaction.

Clinical decision support systems will continue to be an area of innovation and research, and we will only realise their true potential to improve healthcare and patient outcomes if we learn what does not work, as well as looking for what does.

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Find the full version with references at http://dx.doi.org/10.1136/bmj.m3499

Opportunistic screening versus usual care for detection of atrial fibrillation in primary care

Uittenbogaart SB, Verbiest-van Gurp N, Lucassen WAM, et al

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Find this at: http://dx.doi.org/10.1136/bmj.m3208

Study question Does opportunistic screening in primary care increase the detection of atrial fibrillation compared with usual care?

Methods This cluster randomised controlled trial was set in 96 primary care practices in the Netherlands. Patients were aged 65 or older with no known history of atrial fibrillation. In intention-to-screen practices, general practitioners performed opportunistic screening (that is, screening in patients visiting their practice), consisting of three index tests: pulse palpation, electronic blood pressure measurement with an atrial fibrillation algorithm, and electrocardiography (ECG) with a handheld single lead electrocardiographic device. The reference standard was 12 lead ECG, performed in patients with at least one positive index test result and in a sample of patients (10%) with three negative test results. If 12 lead ECG showed no atrial fibrillation, patients received an invitation for further screening by continuous monitoring with a Holter electrocardiograph for two weeks. Patients in the control practices received care as usual. The main outcome was the difference in the detection rate of atrial fibrillation diagnosed over one year in the intention-to-screen versus the usual care practices.

Study answer and limitations In the intention-to-screen practices, 144 new diagnoses of atrial fibrillation were detected in 8874 patients versus 139 in 9102 patients in usual care practices (adjusted odds ratio 1.06 (95% confidence interval 0.84 to 1.35)). A limitation was that of 9218 eligible patients in the intention-to-screen group, 4106 (44.5%) participated in the screening protocol.

What this study adds In primary care, opportunistic screening in patients aged 65 or older did not lead to a higher detection rate of atrial fibrillation than usual care.

Characteristics of patients with newly diagnosed atrial fibrillation. Values are numbers (percentages) unless stated otherwise

	Intention to screen		Usual care		Detected by one time point screening	
	Women	Men	Women	Men	Women	Men
No	67	77	68	71	9	17
Age (mean (SD) age (years))	79.8 (7.8)	76.2 (6.8)	78.3 (7.4)	76.6 (7.1)	75.6 (5.6)	73.5 (5.2)
Age group:						
65-75	23 (34.3)	36 (46.8)	27 (39.7)	31 (43.7)	5 (55.6)	10 (58.8)
75-85	22 (32.8)	34 (44.2)	25 (36.8)	30 (42.3)	3 (33.3)	7 (41.2)
>85	22 (32.8)	7 (9.1)	16 (23.5)	10 (14.1)	1 (11.1)	0
Hypertension	49 (73.1)	40 (51.9)	47 (69.1)	31 (43.7)	6 (66.7)	8 (47.1)
Stroke or transient ischaemic attack	9 (13.4)	11 (14.3)	15 (22.1)	7 (9.9)	0	0
Diabetes	15 (22.4)	20 (26.0)	21 (30.9)	16 (22.5)	1 (11.1)	2 (11.8)
Heart failure	7 (10.4)	5 (6.5)	9 (13.2)	7 (9.9)	1 (11.1)	1 (5.9)
Thromboembolism	4 (6.0)	5 (6.5)	5 (7.4)	2 (2.8)	0	0
CHA_2DS_2-VASc score*:						
1	0	10 (13.0)	0	5 (7.0)	0	6 (35.3)
>2	67 (100)	67 (87.0)	68 (100)	66 (93.0)	9 (100)	11 (64.7)

*Used to predict thromboembolic risk in atrial fibrillation. CHA_2DS_2=(Congestive heart failure, Hypertension, Age (>65=1 point, >75=2 points), Diabetes, previous Stroke, or transient ischaemic attack (2 points)); VASc=vascular disease (peripheral arterial disease, previous myocardial infarction, aortic atheroma), and sex category (female gender) is also included in the scoring system. CHA_2DS_2-VASc score was determined at the time of diagnosis.
International Classification of Primary Care codes were used.

Funding, competing interests, and data sharing
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Study registration Netherlands Trial Register NL4776 (old NTR4914).