The perfect guideline, a utopia?

Quality of dermatological guidelines: Current status and future improvements

Borgonjen, R.J.

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GUIDELINE-BASED CLINICAL DECISION SUPPORT

Guideline-based clinical decision support in acne patients receiving isotretinoin; improving adherence and cost-effectiveness

Published as
SUMMARY

Background clinical practice guidelines are intended to improve quality of care. However guidelines are often published as long texts and implementation in daily practice is challenging.

Objectives testing the impact of active and passive guideline based clinical decision support (CDS) on laboratory monitoring of acne patients receiving isotretinoin. Aiming to potentially increase guideline adherence and achieve a reduction in clinical practice variation and costs.

Methods all acne patients receiving isotretinoin in the study center were included prospectively, 51 during the 5 months before the CDS introduction and 43 patients in the 5 months after the CDS introduction. We compared adherence to guideline recommended laboratory testing intervals (passive support) and tests (active support) before and after CDS using chi square tests.

Results guideline adherence to laboratory testing intervals was 57% before CDS and 70% after CDS (p = 0.197). Adherence to the recommended tests was 0% before CDS and 63% after (p = <0.0005). Costs of laboratory testing per patient were reduced more than 2.5 fold.

Conclusion Use of guideline based CDS appears to improve adherence to recommended laboratory tests in acne patients receiving isotretinoin and reduces overtesting. Timely laboratory test intervals increased non significantly. Hence, active support was more effective than passive support. Passive CDS remains subject to barriers preventing implementation.
**INTRODUCTION**

Clinical practice guidelines (CPG) intend to assist practitioners about appropriate healthcare for specific clinical circumstances. They have proven to be a tool for condensing the overwhelming quantity of (new) medical knowledge into guidance for clinical practice. A CPG can therefore improve quality of care, but there are barriers to implementation and adherence such as a lack of awareness and inertia of previous practice.

There are also external barriers relating to the guideline itself. Often CPGs are still extensive texts, that can be difficult and cumbersome to read and do not support healthcare practitioners in finding patient-specific recommendations. Those barriers stimulated the development of clinical decision support (CDS) systems, which could ultimately be incorporated into electronic health records (EHR). CDS uses passive or active support to modify clinician behavior through recommendations of specific actions. Not the healthcare professional needs to decide whether consultation of a guideline is necessary, but support is directly and automatically delivered in daily practice.

Implementing guidelines with the help of CDS might improve its acceptance and application. Several studies showed the possibility to reduce costs and increase clinician adherence to CPGs. However, there are mixed results, especially regarding the effects of CDS on timely test ordering. To achieve proper care for acne patients, extensive guidelines have been created by various dermatological associations. To-date, no CDS was used to implement them. The European and Dutch acne guidelines state that laboratory testing is advised according to a certain schedule when prescribing isotretinoin (Fig.1); a drug of choice in many forms of acne. A review and a questionnaire carried out during the 2014 annual meeting of the American Academy of Dermatology showed variation in laboratory testing. As an example, of the 2343 dermatologists who completed the questionnaire 33% ordered monthly complete blood count testing. We want to present the results of a prospective study embedding the acne guidelines on laboratory testing to remind physicians about guideline recommendations in their daily workflow. Adherence to the recommended laboratory testing in acne patients receiving isotretinoin may lead to a reduction of practice variability and costs, while minimizing the patient burden of laboratory testing associated with isotretinoin treatment.
METHODS

Design
A prospective pre- versus post-intervention comparison design was used. Guideline based CDS was embedded in the laboratory order form in the EHR system. When clinicians order laboratory testing after introduction of the guideline based CDS, the support appears. It uses both active components (recommended laboratory tests are already ticked) as well as passive components (repeating the textual guideline recommendation (Fig.1)). Intervention goal is improvement in recommended laboratory testing adherence, both in frequency (passive support) as in the tests used to monitor the treatment (active support).

Data
Data were extracted from the EHR system of the study center (Radboud university medical center).

Subjects
All laboratory orders in acne patients receiving isotretinoin between October 15th 2015 and August 15th 2016 (5 months before and after intervention) were included. Every dermatologist (in training) was counted in. Date of intervention was March 15th 2016 (Fig.1). Patients receiving isotretinoin for an (off-label) indication other than acne were excluded.

Outcomes
The primary outcome was guideline adherence, defined as laboratory testing after 0, 1 and 4 months of isotretinoin therapy and every 3 months thereafter. Shorter or longer intervals were defined as non-adherence. We allowed a window of grace of 7 days and 14 days for recommended testing intervals after 1 month and every 3 months respectively.

The following laboratory tests are recommended: liver enzymes (aspartate aminotransferase and/or alanine aminotransferase) and lipids (triglyceride, low-density lipoprotein, high-density lipoprotein). Any additional tests were regarded as non-adherence. Reasons for non-adherence were analyzed since not every non-adherence is automatically overtesting and more specific tests could be necessary depending on clinical factors (e.g. co-morbidities and/or co-medication).

Secondary outcomes were total cost reduction and number of non-recommended extra laboratory tests and visits per patient before and after the intervention.
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Laboratory testing costs were calculated using the 2016 laboratory pricelist of the study center.

Statistics
Data collection and analysis was performed using Statistical Package for Social Sciences (SPSS®) for Windows, version 22.0. Categorical variables were expressed as numbers and percentages. P-values of <.05 were considered statistically significant. We compared guideline adherence between the groups using chi-square tests.

RESULTS
We identified 108 laboratory orders in 51 acne patients receiving isotretinoin before the introduction of the guideline based CDS and 76 laboratory orders in 43 patients after the introduction. In total 32 patients receiving isotretinoin were excluded (Fig. 1). There were 15 different physicians in the analysis. The majority of physicians contributed 2-4 patients.
Primary outcomes
The data shows an increase in guideline adherence regarding recommended laboratory testing, both in frequency (passive support) as in the tests used to monitor the treatment (active support) (Table 1). However, the increase in adherence with passive support is not statistically significant (Table 1). Adherence is depicted per patient and per laboratory order. Undertesting occurred two times before and three times after the CDS introduction (included in non-adherence; Table 1). Documented reasons for non-adherence to the recommended laboratory tests were co-morbidity (one patient with diabetes and one with Gilbert’s syndrome) and co-medication (one patient with terbinafine and one with prednisone).

<table>
<thead>
<tr>
<th>Adherence passive clinical decision support</th>
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<td>Patients % (no.)</td>
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<td>Before CDS</td>
<td>57% (29)</td>
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Table 1: Guideline adherence before and after passive clinical decision support (timely laboratory testing) and active clinical decision support (recommended laboratory tests)

Secondary outcomes
Total costs for only the laboratory tests were € 2207 before and € 686 after the guideline based CDS. That is a more than 2.5 fold reduction per patient within five months (€ 43 to € 16). The reduction in non-adherent testing is portrayed in Fig.2. There was however no significant reduction in non-recommended extra visits or venipuncture per patient. The mean non-recommended extra visits per patient was 0,43 before implementation of the guideline based CDS tool and 0,32 after. For venipunctures this was 0,59 versus 0,42.
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<td>0% (0)</td>
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<tr>
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<td>70% (30)</td>
<td>77% (61)</td>
<td>63% (27)</td>
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Chi-square 0,197 0,321 <0,001 <0,001

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DISCUSSION
Notwithstanding the absence of statistical significance in the passive CDS part of this study, we are able to show improvement in adherence to recommended laboratory tests and a reduction in costs from test ordering. Our data underlines the importance of improving laboratory testing adherence because, without CDS, none of the laboratory orders were consistent with guideline recommendations and 43% of the patients experienced non-timely laboratory testing. Assuming that the acne guidelines themselves are beneficiary in daily patient care, the results promise a benefit of active CDS.

Being just an addition to an otherwise conventional laboratory order, the guideline based CDS in this study enters daily practice through normal workflow screens, imposes no specific burdens of its own, and is scalable to each patient one desires to reach. Another advantage of the support is the absence of pop-up screens. These screens can have unintended consequences, such as alert desensitization. Perhaps this is the reason why our findings are in contrast with Roshanov et al. This review of

Figure 2: Frequency of non-adherent testing before (1) and after (2) implementation of the guideline based clinical decision support tool in the EHR system.
*The category ‘Other’ consists of ureum (2), lactate dehydrogenase (2), other liver enzymes (4) and glycated haemoglobin (1).
factors associated with success of CDS found that 58% of the randomized controlled trials showed some benefit in clinical process or patient outcomes. Yet, systems that presented advice within EHR or order entry systems were less likely to be effective.\textsuperscript{16}

The effect among dermatologists validates the idea that CDS can improve clinical performance. Still, the adherence after the implementation of the passive textual support was not statistically significantly different. A discrepancy between active and passive support is most likely caused by a barrier in the physician itself. As noted before by Cabana et al. inertia of previous practice seems to be one of the most important barriers to implementation.\textsuperscript{2}

Strengths and limitations
As our study is not randomized, better adherence could be attributed to chance association. On the other hand, our study took place in daily practice by those who are the target of the guidelines: dermatologists caring for acne patients. An advantage of the study design is that all dermatologists received the same support; also those who are convinced that their actions are already in line with guideline standards and decide that there is no need to consult the guideline. Finally, certain possible biases were inevitable. We are aware of the fact that non-reporting is not the same as non-adherence. Clinicians can have other reasons to monitor a patient using (extra) laboratory tests (e.g. a marginal non-elevated value), though those reasons were not given. Another noticeable difference and possible bias is that there are fewer patients included after the CDS intervention than before. A likely explanation may be a reluctance to start isotretinoin during the summer because of the associated photosensitivity.

CONCLUSION
The guideline based CDS in this prospective study appears to improve adherence to recommended laboratory tests in acne patients receiving isotretinoin. It might, in some cases, lead to better timeliness of laboratory test ordering. Also guideline based CDS seems a promising tool to reduce costs. However, active support was far more effective than passive support. Passive CDS remains subject to barriers preventing implementation such as inertia of previous practice. In summary, simple guideline based active CDS that is incorporated into daily workflow can diminish overtesting. Further research will hopefully identify more barrier-free guideline based CDS to reduce nondirected- and overtesting in other conditions.
In summary, simple guideline effective than passive support. Passive CDS remains subject to barriers preventing CDS seems a promising tool to reduce costs. However, active support was far more effective than passive support, leading to better timeliness of laboratory test ordering. Also guideline based adherence. Some reasons why clinicians did not follow guidelines were inertia of previous practice, reluctance to start isotretinoin, and overtesting in other conditions. The guideline based CDS in this study appears to improve adherence to overtesting for ceruloplasmin and improve adherence with clinical guidelines. Laboratory Monitoring and Overtesting for Ceruloplasmin and Improve Adherence With Clinical Guidelines. JAMA Intern Med 2015;175(9):1561-2.