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Improving psoriasis patients’ adherence to topical drugs: A systematic review

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Conflicts of Interest

MTS and KEA have received funding from LEO Pharma. SRF is a speaker for Janssen and Taro, a consultant and speaker for Galderma, Stiefel/GlaxoSmithKline, Abbott Labs, Leo Pharma Inc., has received grants from Galderma, Janssen, Abbott Labs, Amgen, Stiefel/GlaxoSmithKline, Celgene, and Anacor; is a consultant for Amgen, Baxter, Caremark, Gerson Lehrman Group, Guidepoint Global, Hanall Pharmaceutical Co Ltd, Kikaku, Lilly, Merck & Co Inc., Merz Pharmaceuticals, Mylan, Novartis Pharmaceuticals, Pfizer Inc., Qurient, Suncare Research, and Xenoprot; is on an advisory board for Pfizer Inc., is the funder of and a shareholder in Causa Research, and is a shareholder in and majority owner of Medical Quality Enhancement Corporation; he receives royalties from UpToDate and Xlibris.
Improving psoriasis patients’ adherence to topical drugs: A systematic review

Abstract

Background
Poor adherence to topical antipsoriatic drugs limits treatment effectiveness.

Objective
The aim of this study was to investigate how healthcare providers may improve psoriasis patients’ adherence to topical treatment.

Materials and methods
A systematic literature search was performed for English-language articles in Embase, Medline, PsycINFO, Cinahl, Scopus, and the Cochrane Library.

Results
Ten studies of varying quality were identified. Two randomized controlled trials (RCTs) testing the adherence-improving potential of interventions by healthcare providers to support patients showed improvement in adherence to topical treatment. In a prospective study with a pre/post design, an individualized, face-to-face consultation reported an improvement in patient-reported adherence to topical treatment over a 9-week period. Based on seven qualitative studies obtaining insights from either patients or healthcare providers, healthcare providers may need to address socio-economic factors, healthcare system factors, and treatment-, patient- and disease-related factors in interventions that aim to improve the adherence of psoriasis patients to topical antipsoriatic drugs.
**Conclusion**

There is a need to develop better adherence-improving interventions. A good patient-healthcare provider relationship is considered crucial to adherence and may be an important intervention target. Before interventions to improve adherence to topicals can be recommended for the clinic, the intervention should be tested in high-quality RCTs.

**Keywords:** Adherence, healthcare providers, psoriasis, topical antipsoriatic drugs.
Introduction

Psoriasis is an inflammatory disease that affects 2-4% of the Western population [1]. Psoriasis negatively affects quality of life and is associated with comorbidities such as cardiovascular disease [2] and depression [3]. Topical antipsoriatic drugs are the recommended first-line treatment for mild to moderate psoriasis, but adherence to self-administered topical treatments is low, leading to lack of treatment success [4] and a need to prescribe more intensive treatments associated with more side effects and higher economic costs [5-7].

According to the World Health Organization (WHO), increasing the effectiveness of medication adherence may have a far greater impact on the health of the population than any other improvement in specific medical treatments [8]. All phases of patient adherence need to be improved from primary adherence (i.e., the patient collecting the newly prescribed drugs from the pharmacy) to secondary adherence (i.e., the patient uses the drugs as prescribed by the doctor) [9]. In recent years, the use of electronic health (e-health) solutions to improve the adherence of psoriasis patients has been investigated; for example, mobile text reminders are effective in improving adherence to prescribed medication [10]. Moreover, when patients report their symptoms on a weekly basis to a website [11] or use a support application on a smartphone (app) [12], patient adherence to topical antipsoriatic drugs was improved.

However, there may be many barriers to the implementation of e-health-based patient support systems in the dermatology clinics.

In order to enhance adherence to topical antipsoriatic drugs, the improved use of healthcare professionals in the clinic is a good target, which could possibly be implemented in outpatient dermatology clinics. Healthcare providers will not always be present to support their psoriasis patients, nor is it desirable that they should be. Often, however, healthcare providers may not pay enough attention to or be aware of how they can guide patients to proper treatment at home.
A recent review by Devine et al. suggested healthcare providers can positively affect adherence in various ways by dealing with barriers to adherence through an improved patient-physician relationship [13]. However, the review did not systematically search databases including literature reporting qualitative studies, which may be relevant to how the patient-healthcare provider relationship and healthcare-based interventions can be improved. In addition, recent systematic literature reviews reporting adherence of psoriasis patients to prescribed topical antipsoriatic drugs [14,15] have not investigated extensively which elements should be included in adherence-supporting interventions by healthcare providers.

We, therefore, aimed to 1) investigate whether any healthcare provider-based interventions are effective in significantly improving adherence to topical antipsoriatic drugs and 2) report suggestions on how healthcare providers can help improve patient adherence to topical antipsoriatic drugs.

Method

Sources

In December 2018, a systematic literature search was performed for English-language peer-reviewed articles in the following six databases: Embase, Medline, PsycINFO, Cinahl, Scopus, and the Cochrane Library.

Search strategy

A three-block literature search strategy was designed using a combination of search blocks for terms relating to adherence, psoriasis, and topical antipsoriatic treatments.

Appendix 1. The design for this review was in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist [16].
**Inclusion and exclusion criteria**

Inclusion criteria were prospective studies, including intervention studies and randomized controlled trials (RCTs), and qualitative studies. Exclusion criteria were case studies, editorials and reviews.

**Primary outcomes**

Designs of adherence-improving interventions by healthcare providers and suggestions on how healthcare providers can improve the adherence of psoriasis patients to topical antipsoriatic drugs.

**Evaluation of eligibility of studies**

Duplicate independent study selection was done independently by MTS and KEA. The sorting process was performed using Covidence® software version v1182 2ed9290d [17]. Inconsistencies were resolved by consensus.

**Quality assessment**

The quality of the studies was assessed by a modified Critical Appraisal Skills Programme (CASP) tool [18]. The quality assessment was modified for the included RCTs, intervention study with pre/post design, and qualitative studies. To address internal quality, an overall quality assessment was given for each study. Each study was graded by assigning yes, no, and not applicable (NA) to every question. Questions assigned NA were excluded from the overall quality assessment grading. If yes answers comprised 80-100%, the study was considered of good quality. If yes answers comprised 50-79%, the study was considered of medium quality. If yes answers comprised 0-49%, the study was considered of low quality.
The scientific quality of the studies was assessed by MTS and KEA. To reduce risk of bias, the quality assessment of one study co-authored by MTS and KEA [19] was quality assessed by SNT, CMRR, and ASSS. Inconsistencies were resolved by consensus.

**Data extraction**

MTS, SNT, ASSS, and CMRR independently extracted data from the identified studies using a standardized data extraction form. Inconsistences were resolved by consensus.

Suggestions on how healthcare providers can improve adherence to topical antipsoriatic drugs were categorized according to WHO’s five categories for non-adherence, namely: social/economic factors, healthcare factors, and disease-, patient- and treatment-related factors [20].

**Results**

**Study selection**

A total of 10 studies were included after the exclusion of studies by reading title, abstract or full text Appendix 2: three studies were quantitative studies Figure 1, Table 1, consisting of two RCTs [21,22] and one prospective study with no control group [23], while the rest were qualitative studies Table 2, consisting of three focus group studies [19,24,25], one conversation group study [26], and three interviews [27-29].
**Quality assessment**

The quantitative studies were all considered of high quality **Tables 3-4**, and two of the qualitative studies were considered of high quality. The rest were of low-medium quality **Table 5**.

**Clinical trials testing healthcare provider-based interventions to improve adherence**

One RCT [21] reported a significant improvement in adherence over 4 weeks by providing psoriasis patients with individualized training on the correct application of topical therapy while, in another RCT [22], a complex adherence-improving intervention, which consisted of 10 visits with a guided conversation between patient and healthcare provider over 64 weeks, reported a significant improvement in patient-reported adherence. A significant improvement in patient-reported adherence was also reported in a third intervention study with a pre/post design [23] that tested a disease-management program consisting of individualized consultations provided to psoriasis patients by healthcare professionals during a 2-month treatment period **Tables 1-2**.

**Suggestions for how healthcare providers can improve adherence**

In addition to the intervention studies [21-23], the qualitative studies included presented several suggestions for how healthcare providers can support patient adherence to prescribed topical antipsoriatic drugs **Table 6, Figure 2**. The suggestions were reported by psoriasis patients [19,24-29], healthcare providers (dermatologists, nurses, pharmacists, psychologists, and clinical researchers), and health economists [24-26].
Social/economic factors

During consultations, healthcare providers may ask questions about the patients’ skin condition and how it influences their personal life [25]. In order to improve primary adherence, physicians can prescribe affordable medication for patients with economic challenges [19].

Healthcare-system-related factors

Structured one-on-one conversations between healthcare providers and patients and easy access to the healthcare system are considered of higher importance than reminder calls and information materials [22]. Regular follow-up visits, especially for patients who are struggling to cope with psoriasis, may help to improve adherence [30]. Nursing prescribing medication may support adherence, since patients perceive nurses as better listeners who provide more information about the medication than doctors [27]. From a patient point of view, it may increase adherence if fewer different people are involved in a patient’s care, if they are able to get appointments right when they need them, and if they experience continuity in their dealings with the hospital [24,27,31-33]. Establishing with the patients a good relationship that is built on trust, sympathy, and understanding is one of the many strategies that may contribute to an increase in patient adherence. Patients would like to be cared for by competent providers who listen to them and understand their problems, which also helps promote shared decision-making [24]. Healthcare providers may recommend that patients write down questions before the consultation in order to ensure that all their questions are sufficiently addressed [19]. Questionnaires about patient beliefs about medication (BMQ) may help doctors to recognize barriers to adherence [28]. Patients would like longer consultation times and to receive more information on their condition and treatment options [26].
Treatment-related factors

Providing individualized training on the correct application of topical drugs may improve short-term treatment outcomes [21]. Having a patient-centered approach may help patients feel empowered [22]. Patients can be equipped with sufficient information about treatment benefits, side-effects, and treatment regimens [27], as well as actual and potential treatments in the case of disease exacerbation [25]. This information can be provided in written treatment plans and study materials to take home such as booklets, videos, and CD-ROMs [30]. Involving patients in treatment decisions [24] and taking patient preferences into consideration when prescribing medication was suggested by dermatologists and patients [19]. Encouraging patients to talk about medication and its management is relevant, since some patients tend to focus more on their psoriasis rather than their therapy, making it difficult for healthcare providers to identify the patient’s medication challenges [28]. In order to avoid frustration and non-adherence, healthcare providers and patients need to set realistic treatment goals [28]. Patients desire a sense of reassurance from the doctor about using the prescribed product, a sense of the timeframe and extent of expected results from the therapy [26]. Regarding antipsoriatic drugs, topical drugs in particular should be prescribed in a fashion that is easy to use on a regular basis in order to prevent an uncomfortable number of flare-ups [26].

Patient-related factors

Improving patient involvement by providing information and patient education is a well-known strategy for improving treatment outcomes [21]. Patients need help to make home treatments routine [19] and to discuss concerns and various aspects about topical treatments [28]. Since patients often experience embarrassment and life-altering events [26], it is crucial to involve patients actively in decision-making and to acknowledge their frustration and annoyance with the disease by being understanding and empathetic [26,27].
**Disease-related factors**

Providing patients with information about disease and an update on new developments regarding the disease and its treatment options may help patients cope with their disease [25,26]. Healthcare providers should inform patients how to handle disease flare-ups [19] and make sure that the terminologies used to define the condition is properly understood by the patient [28]. Patients wish to be informed about their condition including its course, co-morbidities, and triggers [26].

**Discussion**

**Principal findings**

A total of 10 studies were included [19,21-29]. Three clinical trials reported that healthcare provider-based interventions to support patients improved adherence to topical treatment and clinical outcomes. The interventions tested included individualized training on how to apply topical treatment delivered in either one-on-one conversations or face-to-face consultations [21-23]. Seven qualitative studies reported a need for healthcare providers to support psoriasis patients, e.g., by asking questions about their daily life [25], scheduling regular follow-ups or telephone contacts [30], having fewer people involved in their care, explaining the treatment plan, prescribing simple treatment regimens [27], actively involving the patient in the choice of treatment, helping the patient engage in routine treatment at home, and explaining to the patient how to handle flare-ups properly [24].

*Healthcare provider-based interventions compared to other types of adherence-improving interventions for other chronic diseases*

The adherence of psoriasis patients to prescribed topical drugs can be improved in healthcare provider-based interventions [21-23]. This is consistent with studies of other chronic diseases, such as human immune deficiency virus (HIV) infection [34], hypertension.
[35], and depression [36], that report improved adherence through outpatient visits where trained nurses provided personalized patient education. Among hospitalized patients, improved patient support through the use of a multifaceted pharmacist intervention after discharge, prevented hospital readmissions and emergency room visits [37].

In addition to previous adherence-improving interventions in other chronic diseases, regular face-to-face consultations improved adherence in one intervention study [23]. Based on patients’ self-report, longer consultations that provide better information is a more important determinant of adherence than reminder messages and help desks. However, the dermatology clinics may not have sufficient financial resources to offer longer consultations [26]. Several studies indicated that involving patients in decision-making with respect to medication might improve adherence [19,24,27]. This is consistent with Wilson et al. [38], which reported that shared decision-making in the prescription of medication improved adherence in patients with poorly-managed asthma.

**Strengths and weaknesses of this study**

This review addresses important factors affecting how healthcare providers can improve the adherence of psoriasis patients to topical treatments. The findings from this study can be used in designing adherence-improving interventions in other chronic dermatoses for which topical treatments are indicated. The extensive search strategy of various databases and a broad inclusion of studies gave us a comprehensive review of the available literature, and the majority of the studies included were of high to medium quality. Findings from this study can be used for other chronic diseases.

The weakness of this review is that several search blocks could not be managed in the electronic search, e.g., by including a block for key words relating to healthcare providers, which limited the precision of the comprehensive search strategy. It was not possible to perform a meta-analysis or address publication bias due to the limited number of included articles.
Possible mechanisms and implications for clinicians and policymakers

This study provides more evidence that healthcare providers play a crucial role in improving the adherence of psoriasis patients. It is recommended, therefore, that healthcare providers create a good patient-provider relationship that is built on trust, empathy, and understanding with sufficient information about disease and medication. A good patient-provider relationship, along with holding the patient accountable for taking the medication [39], can support patient adherence Figure 2.

Policymakers are encouraged to prioritize adherence-supporting interventions as a cornerstone for outpatient hospital clinics. Healthcare providers can be educated about how to support patients when they self-administer medication and how to ensure that healthcare providers have the time to instruct and support patients.

Conclusion

Recommendations for future research

There is a need for the implementation of adherence-supporting interventions that improve adherence to topical antipsoriatic drugs. It is recommended that studies involve the insights and perspectives of psoriasis patients as well as those of healthcare providers. The intervention is suggested to consist of simple effective interventions based on actively involving healthcare providers in individual consultations with nurses, doctors, or pharmacists, who instruct and support patients on an individualized level. Physical consultations may be supplemented with e-health consultations, e.g., by the use of tele-dermatology, video consultation in apps or the Internet, to ensure regular follow-up [40]. Focus group studies investigating the perspectives of healthcare providers on the adherence of psoriasis patients need to be conducted in a setting in which the intervention will be tested before being subsequently implemented.
It is recommended that interventions be tested in an RCT, designed according to the recommendations from the Cochrane Collaboration [9], including a minimum in each arm of 60 participants, who will be followed for at least six months using a specified study medication with a validated, objective adherence measurement, including relevant validated disease-specific secondary outcome measurements and the proper blinding with respect to the treatment of patients, healthcare providers, and study personnel [41].

Acknowledgement

Medical researchers at the Odense University Hospital Library helped formulate the block search strategy and search method design.
References


Table 1. Characteristics of included randomized controlled trials (RCTs) and intervention study with pre-/post-design.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Study design</th>
<th>Intervention</th>
<th>Country</th>
<th>Study localization</th>
<th>Number of Participants (n)</th>
<th>Participants' age (years)</th>
<th>Type of topical treatment</th>
<th>Measure of adherence</th>
<th>Results of adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caldara et al. 2017 [21]</td>
<td>RCT</td>
<td>20 minutes individualized medication training by a nurse or other medical staff</td>
<td>Italy</td>
<td>Outpatient clinic</td>
<td>Included (n=104)</td>
<td>Mean. 60.5 years (22-84 years)</td>
<td>Gel Cal BD</td>
<td>Weight*, days of treatment and TTAQ over a 4-week treatment period</td>
<td>Weight (n.i. vs. i. 0.13 ±0.09 vs. 0.14±0.17, ns); days of treatment (n.i vs. i. 21.7 ± 5.2 vs 23.8 ± 4.9, p&lt;0.05) TTAQ (118.5±29.4 vs. 118.7±32.2, ns)</td>
</tr>
<tr>
<td>Reich et al. 2017 [22]</td>
<td>RCT</td>
<td>TTOP comprises of structured guidance for one-to-one conversation between dermatologists/ nurses and their patients delivered at 10 visits over the study period.</td>
<td>Germany, France, Holland, Italy, Spain, UK</td>
<td>Dermatology hospital departments</td>
<td>Included (n=1803)</td>
<td>N.i: 51.0±115.4 ; I, 50.9±15.0</td>
<td>Gel Cal BD</td>
<td>TTAQ over a 64-week treatment period</td>
<td>No significant difference in TTAQ</td>
</tr>
<tr>
<td>de Korte et al. 2005 [23]</td>
<td>Intervention study with pre/post design</td>
<td>A disease program consisting of three individualized face to face consultations over a 2-month period.</td>
<td>England, Ireland, Netherlands, Spain</td>
<td>Dermatology hospital departments</td>
<td>Included (n=330)</td>
<td>Mean = 43.5</td>
<td>Not mentioned</td>
<td>Patient reported on a 7-point ordinal scale after an 8-week treatment period</td>
<td>Week 1, 5.5; week 9, 6.8, p &lt; 0.001.</td>
</tr>
</tbody>
</table>

List of abbreviations: Cal BD, calcitriol and betamethasone propionate; I, intervention; RCT, Randomized Controlled Trial; n.i., non-intervention group; n.s., non-significant; TTAQ, Topical Treatment Adherence Questionnaire; TTOP, topical treatment optimization program; UK, United Kingdom; a, amount of medication used divided by treatment days multiplied by BSA (body surface area). Abbreviations: Cal BD, calcipotriol and betamethasone dipropionate; I, intervention; RCT, Randomized Controlled Trial; n.i., non-intervention group; n.s., non-significant; TTAQ, Topical Treatment Adherence Questionnaire
<table>
<thead>
<tr>
<th>Reference</th>
<th>Study design</th>
<th>Country</th>
<th>Setting</th>
<th>No. of patients (n)</th>
<th>Age (years)</th>
<th>Type of topical antipsoriatic drugs</th>
<th>Results of adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courtenay et al. 2011 [27]</td>
<td>Semi-structured interview</td>
<td>UK</td>
<td>Dermatology clinics where nurses prescribe medication</td>
<td>Patients (n= 42)</td>
<td>32.4(^a)</td>
<td>Not mentioned</td>
<td>Patients experienced that nurses prescribing medication led to active involvement in decisions about their treatment, which contributed to concordance and adherence.</td>
</tr>
<tr>
<td>Reich et al. 2014 [25]</td>
<td>Patient focus group</td>
<td>Patient focus group: 1 from Germany and 1 international: Spain, Denmark, Sweden, Netherlands</td>
<td>Patient focus group: Psoriasis patient organizations.</td>
<td>Patient focus group: (n= 10)</td>
<td>Not mentioned</td>
<td>Not mentioned</td>
<td>The results were used to develop TTOP</td>
</tr>
<tr>
<td>Ring et al. 2007 [24]</td>
<td>Focus group</td>
<td>Sweden</td>
<td>Outpatient dermatology clinics at hospitals</td>
<td>Patients (n=12)</td>
<td>24-72 years</td>
<td>Not mentioned</td>
<td>There’s a need of mutual understanding of needs and expectations between patients and health care professionals.</td>
</tr>
<tr>
<td>Svendsen et al. 2016 [19]</td>
<td>Focus group</td>
<td>Denmark</td>
<td>Outpatient dermatology clinics</td>
<td>Patients (n=8)</td>
<td>Mean 43.5</td>
<td>Different topical drugs</td>
<td>Health care professionals need to listen patient’s treatment preferences and provide regular follow ups.</td>
</tr>
<tr>
<td>Thornelo e et al. 2017 [29]</td>
<td>Interview</td>
<td>UK</td>
<td>Localization that suits the patients best</td>
<td>Patients (n=20)</td>
<td>Mean (n=47)</td>
<td>16/20 patients used topical drugs</td>
<td>Health care professionals have to discuss patients concerns and aspects on topical treatments.</td>
</tr>
<tr>
<td>Thornelo e et al. 2017 [28]</td>
<td>Semi-structured interviews</td>
<td>UK</td>
<td>Localization that suits the patients best</td>
<td>Patients (n=20)</td>
<td>Mean (n=47.2)</td>
<td>16/20 patients used topical drugs</td>
<td>The study identifies a need of developing a condition specific BMQ*</td>
</tr>
<tr>
<td>Uhlenha ke et al. 2010 [26]</td>
<td>Conversation meetings</td>
<td>USA</td>
<td>Outpatient dermatology clinics</td>
<td>Dermatologist (n=5)</td>
<td>18+</td>
<td>Not mentioned</td>
<td>Treatment results can be enhanced by providing oral and written information about disease and treatment plan and by prescribing fast acting treatments.</td>
</tr>
</tbody>
</table>

List of abbreviations: UK, United Kingdom; TTOP, topical treatment optimization program; BMQ, beliefs about medicines questionnaire; USA, United States of America. Explanation: a, amount of used medication /treatment days x BSA (body surface area); b, score from (FORKLAR); a, Mean based on several
Table 3. Quality assessment of randomized controlled trials.

<table>
<thead>
<tr>
<th>Study</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>Overall score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caldarola et al. [21]</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>High quality</td>
</tr>
<tr>
<td>Reich et al. [22]</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>High quality</td>
</tr>
</tbody>
</table>

Explanation of the first row: 1. Did the trial address a clearly focused issue? 2. Was the assignment of patients to treatments randomized? 3. Were all of the patients who entered the trial properly accounted for at its conclusion? 4. Were patients, healthcare providers, and study personnel ‘blind’ as to treatment? 5. Were the groups similar at the start of the trial? 6. Aside from the experimental intervention, were the groups treated equally? 7. Was the treatment effect significant? 8. Was the adherence measured by a validated adherence measurement? 9. Can the results be applied to the local population or in your context? 10. Were all clinically important outcomes considered? 11. Are the benefits worth the harms and costs?

Questions assigned: If yes answers comprised 80-100%, the study was considered of good quality. If yes answers comprised 50-79%, the study was considered of medium quality. If yes answers comprised 0-49%, the study was considered of low quality.

Table 4. Quality assessment of intervention study with a pre-/post-design.

<table>
<thead>
<tr>
<th>Study</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Overall score</th>
</tr>
</thead>
<tbody>
<tr>
<td>de Korte et al. [23]</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>High quality</td>
</tr>
</tbody>
</table>

Explanation of the first row: 1. Did the trial address a clearly focused issue? Was the design adequate? 2. Was the data collection adequate? 3. Was the adherence measured by a validated adherence measurement? 4. Were all of the patients who entered the trial properly accounted for at its conclusion? 5. Can the results be applied to the local population or in your context? 6. Are the benefits worth the harms and costs? 7. Were all clinically important outcomes considered? 8. Was the treatment effect significant?

Questions assigned: If yes answers comprised 80-100%, the study was considered of good quality. If yes answers comprised 50-79%, the study was considered of medium quality. If yes answers comprised 0-49%, the study was considered of low quality.
Table 5. Quality assessment, qualitative studies.

<table>
<thead>
<tr>
<th>Study</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courtenay et al. [27]</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Medium quality</td>
</tr>
<tr>
<td>Reich et al. 2014 [25]</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>NA</td>
<td>No</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>Yes</td>
<td>Low quality</td>
</tr>
<tr>
<td>Ring et al. 2007 [24]</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>NA</td>
<td>Yes</td>
<td>Medium quality</td>
</tr>
<tr>
<td>Svendsen et al. [19]</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Medium quality</td>
</tr>
<tr>
<td>Thorneloe et al. [29]</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Medium quality</td>
</tr>
<tr>
<td>Thorneloe et al. [28]</td>
<td>Yes</td>
<td>NA</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>High quality</td>
</tr>
<tr>
<td>Uhlenhake et al. [26]</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>High quality</td>
</tr>
</tbody>
</table>

Explanation of the first row: Was there a clear statement of the aims of the research? 2. Is a qualitative methodology appropriate? 3. Was the research design appropriate to address the aims of the research? 4. Was the recruitment strategy appropriate to the aims of the research? 5. Was the data collected in a way that addressed the research issue? 6. Has the relationship between researcher and participants been adequately considered? 7. Have ethical issues been taken into consideration? 8. Was the data analysis sufficiently rigorous? 9. Is there a clear statement of findings? 10. Is the research valuable?

Questions assigned: NA were excluded from the overall quality assessment grading. If yes answers comprised 80-100%, the study was considered of good quality. If yes answers comprised 50-79%, the study was considered of medium quality. If yes answers comprised 0-49%, the study was considered of low quality.

Abbreviation: NA, not applicable.
Table 6. Suggestions for how healthcare providers can help improve the adherence of psoriasis patients to topical antipsoriatic drugs.

<table>
<thead>
<tr>
<th>Determinants of adherence categorized by World Health Organization (WHO) determinants of nonadherence</th>
<th>How healthcare providers can improve patient adherence to self-administered topical treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Healthcare system-related factors</strong></td>
<td>Reich et al. [22] Engage in structured one-on-one conversations, provide a telephone/e-mail helpdesk. De Korte et al. [30] Provide regular follow-ups and face-to-face consultations with patients struggling to cope with psoriasis. Courtenay et al. [27] Using nurses to prescribe medication, increase the number and flexibility of appointments, reduce no. of different people involved in care, telephone follow-ups by nurses between appointments, service access in local settings, quick access to specialist nurses, opportunity to see the same nurse over a period of time, confidence in prescriber and active listening. Reich et al. [25] Build relationship with the patient over time. Ring et al. [24] Listen to patients and understand their problems, opportunity to get an appointment right away when needed, continuity on repeated consultations, treatment based on shared decision-making. Svendsen et al. [19] Provide frequent follow-ups, take time to listen to the patient, instruct patients to write down questions prior to the consultation. Thorneloe et al. [28] Recognize the patient’s barriers to adherence. Thorneloe et al. [29] Use BMQ to assess patients’ medicines belief. Uhlenhake et al. [26] Attain a strong patient-physician relationship.</td>
</tr>
<tr>
<td><strong>Treatment-related factors</strong></td>
<td>Caldarola et al. [21] Individualized training on correct application of topical treatment by dermatologist or nurse. Reich et al. [22] Provide treatment reminder calls and information materials. De Korte et al. [30] Treatment instructions on videotapes and CD-ROM. Courtenay et al. [27] Sufficient information about treatment benefits and side-effects, easy and simple treatment regimens, written treatment plans. Reich et al. [25] Provide information about treatment and potential treatment in case of disease exacerbation. Ring et al. [24] Involve patients in treatment decisions, doctors should allow patients to try new medications, prescribe feasible treatment that fits in the patient’s everyday life. Svendsen et al. [19] Be able to listen to the patient’s treatment</td>
</tr>
</tbody>
</table>
preferences and provide information about the treatment
Thorneloe et al. [28] Encourage patients to talk about medication and its management.
Thorneloe et al. [29] Differentiate between long- and short-term side-effects of medication
Uhlenhake et al. [26] Provide information about treatment, curability, and prognosis, patients and healthcare providers should set realistic expectations at the beginning of treatment to avoid frustration and noncompliance with treatment, healthcare providers should set treatment goals with a timeline and alternative options.

| Patient-related factors | Caldarola et al. [21] Involving patients in their own care by providing patient education. Uhlenhake et al. [26] Provide oral and written information about treatment plan. Thorneloe et al. [29] Discuss patient concerns and issues respecting topical treatments. Courtenay et al. [27] Actively involve patients in decision-making. Svendsen et al. [19] Help the patient set up routines around home treatment. Thorneloe et al. [29] Recognize conflicting treatment goals and try to understand patients’ beliefs about illness and medication. Uhlenhake et al. [26] Acknowledge the frustration and annoyance of the disease. |
| Disease-related factors | Reich et al. [26] Provide information about the disease. Svendsen et al. [19] Inform the patient about how to handle disease flare-ups. Thorneloe et al. [28] Ensure that the terminology used to describe the condition matches with patient perceptions of the condition, differentiate between the impact of medication on physical symptoms and psychological well-being. Uhlenhake et al. [26] Provide oral and written information about condition, including courses, comorbidity, progression, triggers for flare-ups. |

List of abbreviations: BMQ, beliefs about medication questionnaires; CD-ROM, Compact Disc - Read Only Memory.
Legend Figure 1.

Trial flow depicting the selection process of studies included in the study.

Records identified through database searching (n = 7758)

Records after duplicates removed (n = 7611)

Records screened (n = 7611)

Full text articles accessed for eligibility (n = 91)

Studies included in qualitative synthesis (n = 10)

Record excluded (n = 7520)

Full text articles excluded with reasons (n = 81)
- 57 Wrong outcomes
- 13 Wrong study designs
- 7 Editorials
- 2 Article could not be retrieved
- 2 Study protocols


For more information, visit www.prisma-statement.org.
Legend Figure 2.

The healthcare provider-patient relationship is fundamental for high treatment adherence. A good patient-provider relationship that is built on trust, empathy, and understanding is the key element for improving patient adherence and holding the patient accountable for using the prescribed treatment (bottom row). In addition, the combination of a good patient-provider relationship, sufficient information about the disease and medication, affordable medication, treatment reminders and regular follow-ups (middle row) can lead to even better medication adherence (upper row).