ORIGINAL ARTICLE OPEN ACCESS

Inflammatory Diseases

Early Use of Beneficial Biological Therapy on Younger Psoriasis Patients: Could a 'Step-Down' Therapy Approach Be More Effective?

Yasmina Behlock[1] | Celine Dandoy[1] | Fabienne Willaert[1] | Claire Debusscher[1] | Hassane Njimi[2] | Farida Benhadou[1] | Veronique del Marmol[1] | Jonathan M. L. White[1,3]

[1]Department of Dermatology, Brussels University Hospital, Brussels, Belgium | [2]Department of Biostatistics, Brussels University Hospital, Brussels, Belgium | [3]Ecole de Santé Publique, Université libre de Bruxelles, Brussels, Belgium

Correspondence: Yasmina Behlock (yasmina.behlock@gmail.com)

Received: 14 January 2025 | **Revised:** 31 January 2025 | **Accepted:** 4 February 2025

Funding: Unrestricted grant from Almirall.

Keywords: biological treatment | PASI75 | psoriasis | psoriasis treatment | treatment algorithm

ABSTRACT

Introduction: Psoriasis is a chronic autoimmune skin disorder affecting roughly 2% of the population worldwide. This condition manifests variably due to individual phenotypes. As the number of therapies has increased, Belgium established its own registry. However, these treatments are often inaccessible due to reimbursement criteria. This study suggests that some groups of psoriasis patients (particularly younger patients) may selectively benefit from early treatment approaches with biological therapies.

Material and Methods: Patients diagnosed with psoriasis included in the Belgian Psoriasis Registry were included in the study. Collected data included socio-demographic changes, lifestyle changes, psoriasis-related characteristics, treatment specifics and treatment changes, and associated diseases.

Results: Two hundred and five patients were included. Patients were classified as responders if their Psoriasis Area Severity Index (PASI) score decreased by more than 75% between the initial visit and follow-up (PASI75).

47% of patients achieved PASI75. In the short-term, 50% of patients treated with biologic therapy, 30.5% on systemic conventional therapies, and 32.25% on topicals/phototherapy responded with PASI75. At long-term follow-up, an increase in response was observed in patients receiving biologic therapy, as well as in patients undergoing systemic conventional therapy (55.5%). Patients receiving treatment shortly after their first lesions' onset had better responses (p value < 0.0001).

Conclusion: Intervening earlier with effective treatments improves outcomes, particularly in younger patients. Treatment algorithms should use a step-down approach rather than a step-up approach. This would enhance the number of responders and potentially reduce costs.

1 | Introduction

Psoriasis is a chronic autoimmune skin disorder that affects 2% of the population worldwide. Its clinical course is variable due to individual phenotypes [1], genetic factors, and other external variables.

Psoriasis can have a devastating effect on physical and emotional well-being. Both physical and emotional factors may reduce overall quality of life [2].

Psoriasis is associated with various comorbidities, most notably arthropathy, primarily in the form of oligoarthritis affecting

the distal joints, which impacts approximately 20%–30% of individuals with psoriasis [3]. Additionally, there is an increased cardiovascular risk, with a correlation observed in relation to the severity of psoriasis [4–6]. Other comorbidities, including inflammatory bowel disease, malignancy, depression, and anxiety, are frequently associated with psoriasis [6].

As the number of therapies increases, numerous European countries have established their own psoriasis studying the follow-up process for patients enrolled in the BePso. The primary objective is to study the efficacy of diverse treatment modalities using long-term, real-life data. Patients must meet specific criteria, such as registries, mainly concentrating on the efficacy of biological therapies.

Psonet has been established to consolidate information from various registries. The intention is to analyze data from different countries collectively, providing more robust and comprehensive results from a larger and more diverse data source [7].

In this context, Belgium established its registry (BePso) in 2019 and joined other European countries in data analysis to enhance the understanding and management of psoriasis patients. The registry includes all patients with psoriasis, regardless of their disease severity, previous treatments, or current treatment (topicals, phototherapy, systemic conventional therapy, and biological therapy).

Our current project studies the follow-up process for patients enrolled in BePso. The primary objective is to study the efficacy of diverse treatment modalities using long-term, real-life data. Patients must meet specific criteria, such as treatment with conventional immunosuppressives, before having access to highly efficacious biological therapy. We aimed to find out: Is this truly the best approach to patient care?

2 | Materials and Methods

Patients diagnosed with psoriasis and already included in the Belgian Psoriasis Registry were interviewed during their regular follow-up consultations in the dermatology department at Erasmus Hospital. The follow-up data analysis was approved by our Ethics Committee (P2018/623/B406201838194).

This study comprised two phases:

1. A retrospective segment was included for patients at the initial stages of the registry study who underwent a follow-up consultation but did not respond to the follow-up questionnaire. Existing follow-up data was transcribed into a follow-up format.
2. The prospective segment for patients already included in the registry is currently being monitored at Erasmus Hospital. The patients, with the clinician's help, completed the follow-up questionnaire.

2.1 | Follow-Up Questionnaire

The questionnaire was divided in two parts: the clinician's and the patient's questionnaire (See Supporting Information).

2.2 | Participants

We gathered information on 205 patients. In the retrospective segment, we successfully collected data from 104 participants already included in the Registry. The inclusion criteria were the presence of the PASI score in the patient's file and follow-up consultations occurring before 35 weeks post-inclusion or after 40 weeks post-inclusion. The exclusion criteria involved individuals not enrolled in the Registry, those who did not provide consent, or those with incomplete medical records.

In the prospective segment, we included 101 participants who had already enrolled in the Psoriasis Registry, attended their follow-up consultation, consented to respond to our questions, and properly completed the follow-up form, regardless of their treatment or disease activity. We excluded psoriasis patients who did not or could not give consent or lacked substantial information while answering the form.

2.3 | Data Storage

RedCap software, a browser-based, metadata-driven electronic data capture (EDC) software [8], was used to gather our data securely.

2.4 | Statistical Analysis

Data are presented as means with standard deviations or medians and interquartile ranges for continuous variables and as numbers and percentages for categorical variables. The *t*-test, Mann–Whitney test, Fisher's exact test, and Chi-square test were used as appropriate for comparing groups. All statistical tests were two-sided; p-values less than 0.05 were deemed statistically significant. Statistical analyses were conducted using IBM SPSS 27 statistical software for Windows (IBM Corporation, Somers, NY), supervised by a biostatistician.

3 | Results

Our registry comprised more than 400 patients as of April 2024.

By applying our inclusion and exclusion criteria to our population, we collected data from 205 patients. Eighty-three (40.0%) had a follow-up before 35 weeks (short-term), while 122 (60.0%) had their follow-up after 40 weeks (long-term).

We assessed the response to treatment by a change in their PASI score. Patients were classified as responders if their PASI score

decreased by more than 75% between the initial and follow-up visits.

The median age in our cohort was 53 years; the majority were male (60.5%), with a mean body mass index (BMI) of 27.50 kg/m^2 (Table 1). The most represented ethnic origin was Caucasian (66.8%).

3.1 | Treatment Responders

In our cohort, 47% of patients responded to their treatment. In the short term, among patients under biological therapy, systemic conventional therapies, and topicals/phototherapy, 50%, 30.5%, and 32.25% responded (PASI75) to their treatment, respectively.

At long-term follow-up, an increase in response was observed in patients receiving biological therapies (57%). However, patients undergoing conventional systemic therapy tend to respond more slowly. In the long term, they approach the same level of efficacy as biological therapies (55.5%). Patients receiving topicals/phototherapy also showed a moderate increase in response in the long term (50%) (Figure 1).

TABLE 1 | General characteristics of the study population with demographics.

Gender *n* (%)	
Female	81.0 (39.5%)
Male	124.0 (60.5%)
Age (median [IQR], years)	53.0 [36.0–65.0]
BMI (mean ± SD, kg/m^2)	27.5 ± 5.3
Smoking status *n* (%)	
Never smoked	83 (40.5%)
Current smoker	66 (32.2%)
Quit smoking	56 (27.3%)
Alcohol *n* (%)	
Never	74 (36.1%)
Rarely	69 (33.7%)
Every week	30 (14.6%)
Every day	31 (15.1%)
Treatment groups	
Topicals/phototherapy	61 (29.7%)
Biological therapy	81 (39.5%)
Systemic conventional therapy	63 (30.7%)
Clinical severity measurement tool (median, [IQR])	
PASI baseline	3.5 [0.78–9.0]
PASI follow-up	1.2 [0.00–4.4]

Note: Valid percent is calculated as the percentage of known values.
Abbreviations: IQR, interquartile range; PASI, Psoriasis Area Severity Index; SD, standard deviation.

There was no significant difference in results between PASI75 and PASI90.

3.2 | Characteristics of Patients

In the short term, the median age was 36.9 [26.3–60.0] years for responders and 56.4 [34.1–65.2] years for non-responders (Table 2). Results almost reached statistical significance (p value 0.054).

There is no difference in the age at long-term, BMI, and duration between the first lesion and follow-up between responders and nonresponders in short-term and long-term patients.

If we take the last characteristic apart and analyze it in each treatment group:

3.3 | Duration Between First Lesion and Follow-Up in Specific Groups

Patients who receive treatment promptly after the onset of their first lesions have better responses (p value < 0.0001) (Table 3). Patients treated rapidly with biologic therapy seem to respond better in the short term, while those under systemic conventional therapy seem to have better long-term responses (Table 4).

4 | Discussion

In our cohort, 47% of patients responded to treatment. This response depended on the treatment type. Patients on biologic therapy tended to respond faster to treatment; patients undergoing conventional therapy responded equally well but much slower.

Patients undergoing topical treatments or phototherapy typically exhibit a modest response in the short term. This response tends to improve slightly over the longer term. The number of studies conducted on topical treatments is very limited, but it is crucial to remember that patients with mild disease severity do not usually have access to biologic therapy (e.g., due to reimbursement criteria) but still require treatment. Topical treatments may be effective and less expensive; however, many patients discontinue their treatment due to the lack of efficacy and the impact on their quality of life [9], so the overall costs may not be so different from other treatment modalities.

Schmitt et al. discussed the advantages of biologic therapy compared with conventional systemic therapies at the 8-to-16-week follow-up [10]. A systematic review comprising 32 articles highlighted that many systemic conventional therapies, including methotrexate and fumarates, demonstrate higher efficacy over the long term. Specifically, PASI75 was achieved by 47% of patients treated with fumarates and 40%–49% of those treated with methotrexate at short-term follow-up (12–16 weeks). However, these rates increased significantly to 76% and 81%, respectively, at long-term follow-up (> 1 year) [11]. Another systematic review confirms our results. Similarly, deucravacitinib, etanercept, and infliximab demonstrated short-term PASI75 responses higher than

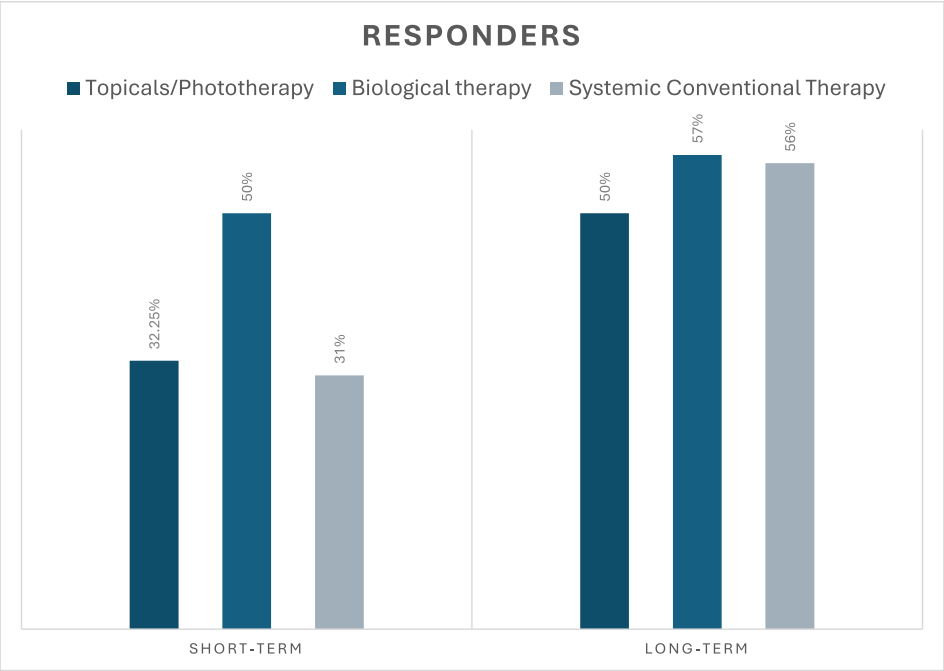

FIGURE 1 | Treatment outcomes between responders and non-responders in the short-term and long-term. This bar graph illustrates the difference in Psoriasis Area and Severity Index (PASI) scores between responders and non-responders in the short-term group (< 35 weeks) and long-term group (> 40 weeks). Data are expressed as percentages.

TABLE 2 | Comparison of characteristics between responders and non-responders in short-term and long-term outcomes (age, BMI, duration between first lesion and follow-up).

	Short-term			Long-term		
	Responders	Non-responders	*p* value	Responders	Non-responders	*p* value
Age (years)	36.9 [26.3–60.0]	56.4 [34.1–65.2]	0.054	53.1 [40.1–65.3]	54.0 [39.0–70.0]	0.412
Body mass index (BMI) (kg/m^2)	27.1 ± 5.3	28.0 ± 6.6	0.606	27.1 ± 4.4	27.6 ± 5.2	0.698
Duration between first lesion and follow-up (years)	12.1 [7.0–17.3]	11.2 [2.8–23.3]	0.640	22.2 [11.6–30.1]	23.9 [16.3–32.2]	0.307

non-biologic therapies. In the long term, the percentage of patients treated with deucravacitinib who achieved PASI75 increased [12].

4.1 | Age and Response

The median age of short-term responders is 36.9 years; meanwhile, the median age of non-responders is 56.4 years.

4.1.1 | Younger Patients Seem to Respond Faster to Treatment Than Older Patients

The over-65 age group exhibited slower improvement at 16 weeks, particularly compared to the 40–65 age group [13]. Contrary to our results, some other studies have suggested that biologic therapies are more effective for moderate to severe patients, particularly in elderly individuals. Piaserico et al. showed > 60% response under biological therapy for 187 elderly patients in the short term compared with systemic conventional therapy and phototherapy [9]. Sample size could have played a role in these results.

However, Linnemann et al. showed that age at diagnosis is a predictor for initiating biological therapies. Using Cox regression, their analysis showed that younger patients are more likely to receive biologic therapy earlier [14]. When the results of both studies are considered together, they further support the fact that early treatment in younger patients may lead to a faster and more effective response to therapy.

4.1.2 | Early Intervention: The New Approach to Treatment?

In recent years, with the advancement of new treatments, the approach to managing many inflammatory autoimmune diseases has changed, leading to faster initiation of systemic

therapies, especially biologic therapy. Whether for Crohn's disease, multiple sclerosis, rheumatoid arthritis, or even psoriatic arthritis, early intervention has been shown to provide better disease control, improved clinical outcomes, and higher remission rates [15].

Few studies in psoriasis evaluate whether prompt initiation of biologic treatment after the onset of the first lesions results in a better treatment response. Among these, two randomized controlled trials—the STEPIn study and the GUIDE study—showed favorable results for initiating early biological therapy [15]. The GUIDE study, currently in Phase IIIb, identified a category of super-responders: patients who had psoriasis for less than 2 years, responded to guselkumab, and achieved PASI100 within 20 weeks. These super-responders mainly were individuals under 45 years old, which aligns with our study. Additionally, predictors of these super-responders included patients who had not received any systemic therapies prior to this biological therapy, highlighting the importance of initiating and treating early with biologic therapies without necessarily trying other treatments [16]. These findings are consistent with our study: *We demonstrated that patients treated promptly with biological therapy exhibit better responses and respond faster to treatment. Early treatment with systemic conventional therapies was also associated with improved treatment responses.*

Due to reimbursement criteria in Belgium, individuals are treated using a step-up approach and are required to undergo phototherapy, conventional systemic therapy, and demonstrate an initial severity score (PASI) of more than 10 or a BSA > 10% before being eligible for biological therapy [17] (Figure 2). Yet our data suggest that treating such patients with biological therapy earlier than currently possible could lead to better treatment outcomes.

Could modifying the treatment ladder serve both patients and society better? The requirement to undergo multiple treatments prior to biological therapy, a step-up approach, may not be the most cost-effective approach, as it often leads to increased doctor visits, possible treatment nonadherence, frequent changes in therapy, and absenteeism from work due to treatment schedules such as three times a week phototherapy appointments. Moreover, with the emergence of biosimilars, treatment costs could decrease, allowing more budgetary flexibility to permit a step-down approach in targeted patient groups, such as younger patients.

Using the conventional approach, the economic burden of psoriasis on society is significant. Annually, the cost per patient has been evaluated at €11,928 in Sweden, €8372 in Italy, and approximately €6000 in Germany [18]. The annual cost per patient in Belgium has not yet been published, but it is one of our future goals and is likely to be similar to other industrialized European countries.

The burden of disease is not only significant for society but also for patients. Mustonen et al. demonstrated that costs to patients could not be overlooked, especially for those undergoing systemic conventional therapies and phototherapy [19]. Travel and time costs account for 60% of the expenses of phototherapy. Additionally, topical treatments are highly time-consuming and may contribute to a decline in patients' quality of life [19], as evidenced by Questions 10 of the Dermatology Life Quality Index (DLQI) and 15 of the Psoriasis Disability Index.

Using the example of inflammatory bowel disease (IBD), a new top-down approach where highly efficacious therapy like biologics is initiated early has been discussed to manage patients better and provide more effective care (as opposed to the step-up approach, where milder treatments are tried before escalating to stronger therapies). This new management strategy is gaining more recognition over the years, as it can potentially improve patient outcomes by initiating advanced treatments early. However, the main obstacle to fully adopting this approach is economic [20].

Strober et al. showed that traditional severity scores alone may not be the best way to quantify disease severity [21]. Patients could have a PASI < 10 but still have a significant reduction in their quality of everyday life. This is why the International Psoriasis Council (IPC) recently changed the definition of

TABLE 3 | Duration between the first lesion and follow-up in each treatment group at short-term and long-term.

Short-term + long-term	Responders	Non-responders	*p* value
Biological therapy	23.9 [15.5–30.03]	27 [18.5–34.7]	< 0.001
Topicals/phototherapy	15.3 [7.0–27.1]	12.3 [7.0–21.5]	
Systemic conventional therapy	11.7 [8.1–21.9]	16.3 [5.8–26.0]	

TABLE 4 | Duration between first lesion and follow-up in each treatment group at short-term and long-term outcomes separately.

	Short-term		Long-term	
	Responders	Non-responders	Responders	Non-responders
Biological therapy	16.4 [12.2–22.8]	34.7 [10.8–51.3]	25.6 [17.2–34.2]	26.6 [18.7–30.7]
Topicals/phototherapy	10.7 [5.2–36.1]	8.2 [4.2–14.2]	22.0 [8.5–27.1]	20.1 [10.3–31.0]
Systemic conventional therapy	9.5 [6.4–15.4]	11.9 [2.5–23.3]	13.9 [8.6–25.0]	23.1 [17.8–36.2]

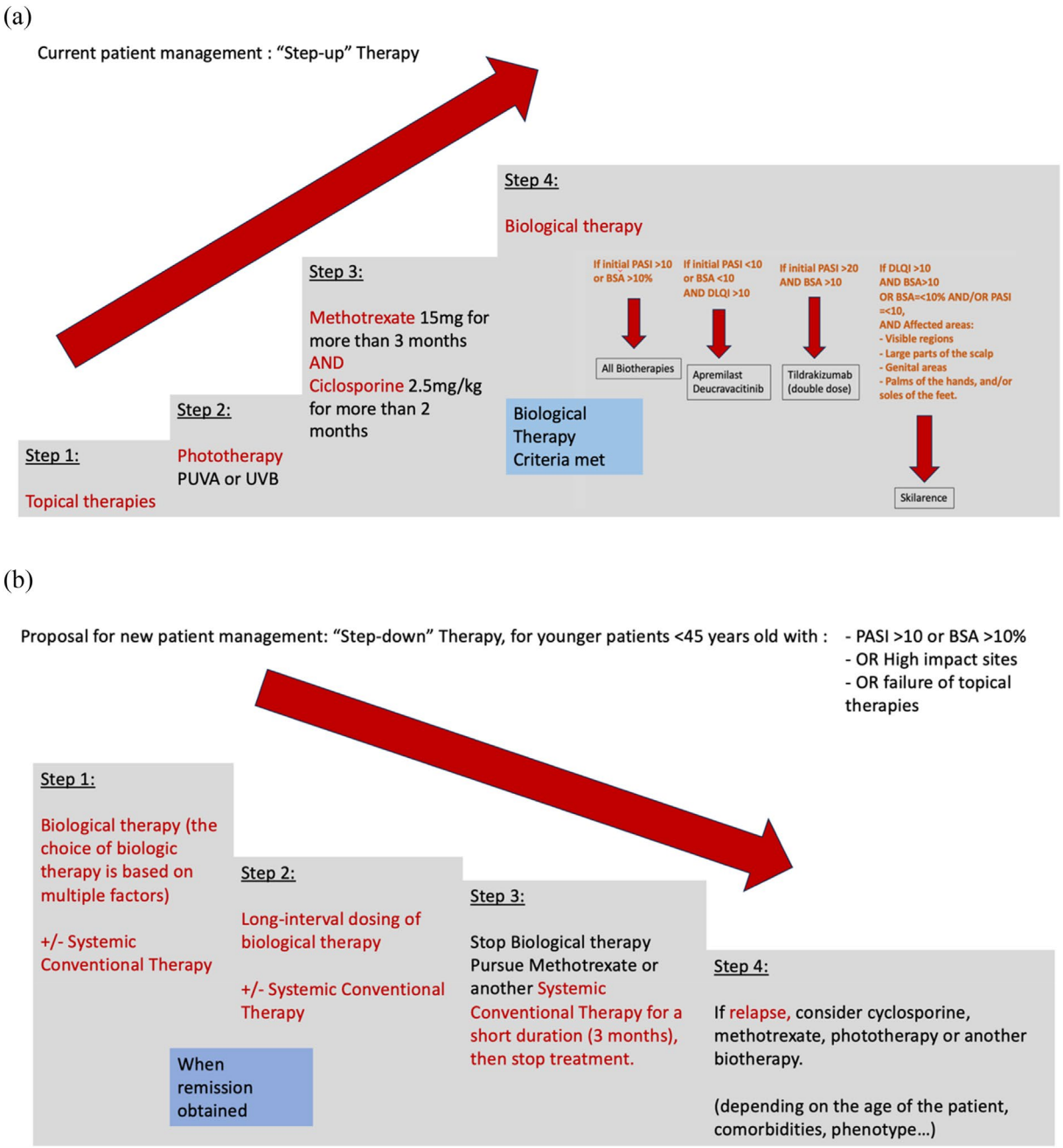

FIGURE 2 | Treatment management algorithm for moderate to severe psoriasis patients. (a) Schematic representation of the current step-up approach used in Belgium, where patients must follow these steps to gain access to biological therapies based on reimbursement criteria. (b) Proposed step-down management algorithm for patients under 45 years old, with PASI > 10 or BSA > 10%, high-impact sites, or failure of topical therapies, suggesting earlier access to biologic therapies.

psoriasis severity and classification. Patients who should have access to systemic therapies are those with a BSA > 10%, a high-impact site (face, palms, soles, genitalia, scalp, or nails), or a failure with topical therapies [21].

We propose modifying the sequence of treatments with a step-down approach, especially in younger patients (< 45 years), by applying the new severity classification of the IPC: Initiating with biological therapies for a limited duration. Once the patient achieves remission, there would be a reduction in dosing frequency (long-interval dosing), which has been proven beneficial and cost-effective [22]. This would be followed by transitioning to less intensive treatments, avoiding abrupt discontinuation (Figure 2). This may involve continuing with conventional systemic therapies or switching to phototherapy as needed, depending on the age and phototypes of the patient.

This way, more individuals might have access to biological therapy, even if their PASI score is less than 10, provided their psoriasis is sufficiently extensive to benefit from these treatments. This step-down approach could be more efficient, potentially more cost-effective, and even promote compliance among patients.

Studies have shown that phototherapy can induce DNA damage in the skin, thereby increasing the risk of malignancies, especially for younger patients [23]. Considering the traditional sequence of administering phototherapy before immunomodulator therapies, the potential for causing DNA damage before modulating the immune system may increase the risk of developing skin cancer in the long term.

It may be more logical to initiate treatment with immunomodulator therapies first. Once the patient achieves remission, treatment can then be continued with phototherapy, if necessary, thereby reducing the risk of relapse after discontinuing biological therapy.

Modifying the treatment sequence could prove beneficial for patients. Further studies are necessary to assess the cost-effectiveness of this treatment approach.

4.2 | Follow-Up as a Necessary Tool for Patient Management

The information from follow-up appointments could help us develop a new patient management approach, enabling us to treat selectively and respond quicker (Supporting Information).

5 | Conclusion

In conclusion, this study adds novel considerations to the literature. We observed the importance of promptly treating patients after the onset of their first lesions to ensure the best possible response, particularly in younger patients. Transitioning toward a management strategy that prioritizes early intervention with biological therapy, using a step-down approach rather than a step-up approach, could potentially enhance the number of responders, improve patient care, and even prove more cost-effective.

Using a follow-up tool like the one proposed in our study enables essential data collection for better patient management, representing a pivotal initial step toward this new approach to patient care.

Conflicts of Interest

Dr. Claire Debusscher received support for attending meetings and/or travels for UCB, Abbvie, and Lilly. Pr. Véronique Del Marmol received grants/contracts from BMS, MSD, Almirall, and Sanofi; consulting fees from BMS, NOVARTIS, Sanofi, Almirall, Abbvie, and Léo; payment/honoraria for lectures, presentations, speakers' bureaus, manuscript writing, and/or educational events from Sun Pharma, BMS, MSD, Sanofi, and Novartis. The other authors have no conflicts of interest to declare.

References

1. R. G. Petit, A. Cano, A. Ortiz, et al., "Psoriasis: From Pathogenesis to Pharmacological and Nano-Technological-Based Therapeutics," *International Journal of Molecular Sciences* 22, no. 9 (2021): 4983.

2. R. Parisi, D. P. Symmons, C. E. Griffiths, D. M. Ashcroft, Identification, Management of P, and Identification and Management of Psoriasis and Associated ComorbidiTy (IMPACT) project team, "Global Epidemiology of Psoriasis: A Systematic Review of Incidence and Prevalence," *Journal of Investigative Dermatology* 133, no. 2 (2013): 377–385, https://doi.org/10.1038/jid.2012.339.

3. L. C. Coates and P. S. Helliwell, "Psoriatic Arthritis: State of the Art Review," *Clinical Medicine (London, England)* 17, no. 1 (2017): 65–70.

4. A. W. Armstrong and C. Read, "Pathophysiology, Clinical Presentation, and Treatment of Psoriasis: A Review," *JAMA* 323, no. 19 (2020): 1945–1960.

5. J. J. Wu, A. Kavanaugh, M. G. Lebwohl, R. Gniadecki, and J. F. Merola, "Psoriasis and Metabolic Syndrome: Implications for the Management and Treatment of Psoriasis," *Journal of the European Academy of Dermatology and Venereology* 36, no. 6 (2022): 797–806.

6. J. Takeshita, S. Grewal, S. M. Langan, et al., "Psoriasis and Comorbid Diseases: Implications for Management," *Journal of the American Academy of Dermatology* 76, no. 3 (2017): 393–403.

7. L. Eissing, S. J. Rustenbach, M. Krensel, et al., "Psoriasis Registries Worldwide: Systematic Overview on Registry Publications," *Journal of the European Academy of Dermatology and Venereology* 30, no. 7 (2016): 1100–1106.

8. P. A. Harris, R. Taylor, R. Thielke, J. Payne, N. Gonzalez, and J. G. Conde, "Research Electronic Data Capture (REDCap)—A Metadata-Driven Methodology and Workflow Process for Providing Translational Research Informatics Support," *Journal of Biomedical Informatics* 42, no. 2 (2009): 377–381.

9. S. Piaserico, A. Conti, F. Lo Console, et al., "Cassano Efficacy and Safety of Systemic Treatments for Psoriasis in Elderly Patients," *Acta Dermato-Venereologica* 94, no. 3 (2014): 293–297, https://doi.org/10.2340/00015555-1719.

10. J. Schmitt, S. Rosumeck, G. Thomaschewski, B. Sporbeck, E. Haufe, and A. Nast, "Efficacy and Safety of Systemic Treatments for Moderate-To-Severe Psoriasis: Meta-Analysis of Randomized Controlled Trials," *British Journal of Dermatology* 170, no. 2 (2014): 274–303.

11. J. Zweegers, M. E. Otero, J. M. van den Reek, et al., "Effectiveness of Biologic and Conventional Systemic Therapies in Adults With Chronic Plaque Psoriasis in Daily Practice: A Systematic Review," *Acta Dermato-Venereologica* 96, no. 4 (2016): 453–458, https://doi.org/10.2340/00015555-2276.

12. A. W. Armstrong, R. B. Warren, Y. Zhong, et al., "Short-, Mid-, and Long-Term Efficacy of Deucravacitinib Versus Biologics and Nonbiologics for Plaque Psoriasis: A Network Meta-Analysis," *Dermatology and Therapy* 13, no. 11 (2023): 2839–2857.

13. F. Rosset, L. Mastorino, P. Dapavo, M. Ortoncelli, P. Quaglino, and S. Ribero, "Aging Impact in Response to Different Classes of Biological Treatment in Psoriatic Patients: A Real-Life Observational Study," *Journal of Clinical Medicine* 12, no. 23 (2023): 7215, https://doi.org/10.3390/jcm12237215.

14. E. Linnemann, M. L. Nielsen, L. V. Maul, et al., "Predictors of Initiating Biologics in the Treatment of Psoriasis," *International Journal of Dermatology* 63, no. 10 (2024): e231–e239, https://doi.org/10.1111/ijd.17409.

15. H. Ben Abdallah, T. Emmanuel, A. Bregnhøj, C. Johansen, and L. Iversen, "Early Intervention and Disease Memory in Psoriasis: A Literature Review," *JEADV Clinical Practice* 1, no. 4 (2022): 307–316.

16. K. Javaid and C. Andruszka, "Early Disease Intervention With Guselkumab in Psoriasis Leads to a Higher Rate of Stable Complete Skin Clearance (Clinical Super Response): Week 28 Results From the Ongoing Phase IIIb Randomized, Double-Blind, Parallel-Group, GUIDE Study: An Analysis With Considerations for Future Studies,"

Journal of the European Academy of Dermatology and Venereology 38, no. 4 (2024): e302.

17. E. Riedl, U. Mrowietz, B. J. Hill, C. Sapin, and R. Warren, "Subgroup Analyses by European Country-Specific Reimbursement Requirements Confirm Efficacy for Ixekizumab in Psoriasis," *Journal of Drugs in Dermatology* 21, no. 6 (2022): 659–667, https://doi.org/10.36849/jdd.6620.

18. S. R. Feldman, C. Burudpakdee, S. Gala, M. Nanavaty, and U. G. Mallya, "The Economic Burden of Psoriasis: A Systematic Literature Review," *Expert Review of Pharmacoeconomics & Outcomes Research* 14, no. 5 (2014): 685–705.

19. A. Mustonen, K. Mattila, M. Leino, L. Koulu, and R. Tuominen, "Psoriasis Causes Significant Economic Burden to Patients," *Dermatology and Therapy* 4, no. 1 (2014): 115–124.

20. D. R. Berg, J. F. Colombel, and R. Ungaro, "The Role of Early Biologic Therapy in Inflammatory Bowel Disease," *Inflammatory Bowel Diseases* 25, no. 12 (2019): 1896–1905.

21. B. Strober, Y. Zhong, A. Sima, et al., "Criteria for Identifying Candidates for Systemic Psoriasis Treatment in the Real World: Application of the International Psoriasis Council Guidelines in Patients in North America," *Journal of Psoriasis and Psoriatic Arthritis* 10, no. 1 (2024): 24755303241302070, https://doi.org/10.1177/24755303241302070.

22. J. S. van Bezooijen, M. B. A. van Doorn, M. W. J. Schreurs, et al., "Prolongation of Biologic Dosing Intervals in Patients With Stable Psoriasis: A Feasibility Study," *Therapeutic Drug Monitoring* 39, no. 4 (2017): 379–386.

23. A. Oulee, G. S. Ahn, S. S. Javadi, and J. J. Wu, "Phototherapy and DNA Damage: A Systematic Review," *Journal of Clinical and Aesthetic Dermatology* 16, no. 6 (2023): 55–58.

Supporting Information

Additional supporting information can be found online in the Supporting Information section.