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REVIEW ARTICLE

2023 guidelines on the management of psoriasis by the Dermatological Society of Singapore

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ABSTRACT

Introduction: Psoriasis is a multisystem, chronic, inflammatory dermatological disease. In routine clinical practice, the management of psoriasis varies significantly. The current study aimed to develop a set of practice guidelines relevant to dermatology practice in Singapore.

Method: The Psoriasis Therapeutic Guidelines Workgroup, comprising members of the Dermatological Society of Singapore with a subspecialisation in psoriasis, was convened to develop the guidelines. Clinical questions on selected topics were generated and refined by the workgroup. A literature search using PubMed was performed on their assigned topics from June 2013 to December 2023. The articles were included and graded based on the level of evidence.

Results: The guidelines address topics ranging from clinical assessment to practical considerations in the management of mild, moderate and severe psoriasis, including delivery of care, referrals to specialists and adherence to treatment. The recommended therapies include phototherapy, methotrexate, acitretin, cyclosporine; apremilast; topical corticosteroids, calcipotriol, topical calcineurin inhibitors; and biologics (i.e. adalimumab, infliximab, secukinumab, ixekizumab, ustekinumab, etanercept) either in combina-tion or as monotherapy. Common therapeutic concerns relating to biologic use were addressed. Recommendations on generalised pustular psoriasis, palmoplantar pustular psoriasis and psoriatic arthritis were also made. Patients on systemic therapy would receive appropriate vaccine counselling. Therapeutic implica-tions in special populations, such as pregnant/lactating women, children, the elderly, those undergoing surgery and those suffering from specific infections and cancer were addressed.

Conclusion: These guidelines were developed for dermatologists, family physicians, rheumatologists and other specialists to support their selection of appropriate management options.

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Keywords: biologic therapy, ethnicity, psoriasis, psoriatic arthritis, therapy

CLINICAL IMPACT

What is New

- The Dermatological Society of Singapore has developed guidelines for the management of psoriasis, which is currently managed in diverse ways.
- The guidelines cover aspects of clinical assessment and treatment across severity levels.

Clinical Implications

- The guidelines emphasise the management of pustular and palmoplantar psoriasis, psoriatic arthritis and psoriasis in special populations.
- It also provides a comprehensive framework for dermatologists and promotes standardised patient care.
- Furthermore, the guidelines discuss the indications and selection of biologic therapy in the management of psoriasis.

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INTRODUCTION

Psoriasis is a chronic multisystem, autoimmune and inflammatory dermatological condition. It usually persists throughout one's lifetime, and spontaneous remission is rarely seen. As per the World Health Organization (WHO), the global prevalence of psoriasis is about 0.09%–11.4%.[1]

Psoriasis may be linked to other serious diseases, such as depression, psoriatic arthritis (PsA), diabetes and heart disease. PsA is a common comorbidity occurring concurrently with psoriasis. According to WHO, the global prevalence of PsA is about 1.3%–34.7%.[1] The treatment of psoriasis should address both psychosocial and clinical manifestations of the disease. Several innovative therapies are available for psoriasis, ranging from topical treatment to oral systemic therapy and novel biologic treatments. The treatment regimen is chosen based on the extent of the disease, relevant comorbidities and the effect of the disease on patients' quality of life.

The primary goal of this study is to provide evidence-based guidelines for managing different types of psoriasis, with a focus on plaque psoriasis.

Target group

These guidelines have been developed for dermatologists, family physicians, rheumatologists and other specialists to enhance their understanding of psoriasis and support their decision-making in selecting the most appropriate management option. With the advent of new biologics, these guidelines will also help dermatologists decide on the appropriate indication and selection of biologic therapy. The guidelines are not meant to be a didactic algorithm for the treatment of psoriasis. They should be individualised for each patient and used in conjunction with the personal experience of the prescribing physician.

METHOD

The Psoriasis Therapeutic Guidelines Workgroup comprises 12 dermatologists from the Dermatological Society of Singapore (DSS). They subspecialise in psoriasis and accepted the invitation of the DSS Executive Committee to participate in this workgroup. The aim was to develop a set of practice guidelines for clinicians in Asia, particularly in Singapore, in an easy-to-read format while incorporating more recent literature.

Clinical questions on selected topics were created and refined by the workgroup based on clinical experience as well as feedback on the main concerns of patients with psoriasis and members of the Psoriasis Association of Singapore. A literature search using PubMed was performed by the workgroup members on their assigned topics. Journal articles published from June 2013 to December 2019 were included and graded based on the level of evidence. Subsequently, key articles and references up to December 2023 were reviewed,[2-14] including changes in biologics on the subsidised drug list of the Ministry of Health, Singapore.[15]

These guidelines were based on the first edition of the DSS Psoriasis Management Guidelines, published on 30 June 2016. Therapeutic guidelines existing worldwide, especially the joint American Academy of Dermatology (ADD)-National Psoriasis Foundation (NPF) 2019 guidelines for the management of psoriasis along with an emphasis on awareness and attention to comorbidities; the 2019 joint ADD-NPF guidelines of care in managing psoriasis with biologics; the joint American College of Rheumatology-NPF 2018 guidelines for the management of PsA;[16] the 2017 National Institute for Health and Care Excellence guidelines for the management of psoriasis;[17] the 2009 Canadian guidelines and 2016 Addendum to the Canadian guidelines; the 2017 British Association of Dermatologists guidelines; and the 2017 European S3-Guideline on the systemic treatment of psoriasis vulgaris, were used as references for developing the current guidelines. References were also made to the regional psoriasis therapeutic guidelines and the National Skin Centre psoriasis guidelines in Singapore.

The draft guidelines and evidence were reviewed in a series of workgroup meetings. Consensus was obtained, defined as a minimum of 90% agreement, on guidelines that lacked sufficient evidence from the literature.

Guidelines reflect considerations of benefits and harms, side effects and risks. Social values, psychological aspects and preferences were identified in consultation with patients in public and private healthcare clinics, as well as with members of patient support group, the Psoriasis Association of Singapore.

Expert panel members were invited from different public and private healthcare institutions to ensure a balance of views, equity, feasibility and acceptability. The experts were dermatologists with subspecialisation in psoriasis and special expertise in cutaneous infections and photodermatology. In addition, a rheumatologist, YY Leung, provided input for drafting the section on PsA.

While formulating the guidelines, the experts also considered the costs of biologics and the availability of medication assistance funds. However, they recognised that not all patients would be eligible for funding, and some would seek care as private patients.

The modified Delphi method was used for formulating the guidelines. The workgroup adopted the Scottish Intercollegiate Guidelines Network grading system for the grade of recommendations and level of evidence, presented in Supplementary Table S1.[18] Two key opinion leaders in the field of psoriasis reviewed the guidelines critically. The document was vetted and approved by the entire panel of authors. Statements were accepted when a unanimous agreement was reached. The entire process was completed in 3 rounds. Printed copies of the guidelines were distributed to the members of the DSS.

The guidelines will be updated 5 years after publication. A description of the method followed to develop the guidelines is provided in Supplementary Fig. S1. The guidelines are presented in Supplementary Tables S2 and S3.[19-30]

RESULTS

In addition to addressing the clinical assessment and management of various severities of psoriasis, the guidelines provide detailed recommendations for handling specific subtypes, such as pustular and palmoplantar psoriasis. The scope also includes subgroups of PsA, ensuring comprehensive coverage of the disease spectrum. Moreover, the guidelines offer insights into managing psoriasis in special populations, such as children, pregnant women and individuals with malignancies, recognising the unique challenges and considerations these groups may face in treatment and care. Overall, these guidelines offer a thorough framework for healthcare providers to deliver effective and tailored management strategies for individuals with psoriasis across different manifestations and circumstances.

DISCUSSION

Psoriasis encompasses various subtypes, each presenting distinct clinical features and treatment considerations. Additionally, managing psoriasis requires attention to comorbidities, such as hepatitis, tuberculosis (TB), human immunodeficiency virus (HIV) and malignancies, which may influence treatment decisions and overall disease outcomes. Special considerations, such as pregnancy and adherence management, further highlight the complexity of psoriasis care and the need for tailored approaches to ensure optimal outcomes for patients.

Management of moderate and severe psoriasis

Phototherapy

Phototherapy is the recommended second-line therapy for patients with psoriasis involving >10% of the body surface area (BSA). Both ultraviolet B (UVB) and psoralen + ultraviolet A (UVA) are effective in clearing psoriasis when delivered 2 to 3 times a week in the clearance phase until minimal residual activity. The treatment is then reduced to once weekly or fortnightly during the maintenance phase before cessation.

Conventional systemic therapy

About 20% of patients with psoriasis experience moderate-to-severe symptoms and are considered suitable for systemic therapy.[31] Severe disease is defined as Psoriasis Area and Severity Index (PASI) ≥10, BSA ≥10% or Dermatology Life Quality Index (DLQI) ≥10 (the rule of 10s). The disease in high-impact areas is associated with significant psychological or functional disability (e.g. major parts of the scalp, genitals, palms, soles and intertriginous areas). A summary of recommendations for managing moderate-to-severe psoriasis using phototherapy and systemic therapy is presented in Table 1.[31,32]

Biologics and their use in special situations

Biologics are employed as either standalone treatments or in conjunction with other systemic or topical medications for psoriasis management.[31] A summary of recommendations for the management of moderate-to-severe psoriasis using biologics and in special situations is provided in Table 2.[5,31-35]

Management of pustular psoriasis

Pustular psoriasis, a rare, systemic, immunemediated dermatological disorder, affects both children and adults. It is classified into generalised and localised pustular psoriasis depending on whether the pustules are widespread or localised. A summary of treatment recommendations for generalised pustular psoriasis and palmoplantar pustular psoriasis is presented in Table 3. Moreover, a multicentre study involving Asian patients revealed that intravenous spesolimab enhanced outcomes while managing flares of generalised pustular psoriasis.[4]

Practical considerations in psoriasis

Delivery of care and social and psychological aspects of psoriasis

Psoriasis is associated with several comorbidities, and PsA has arguably the most well-known association with psoriasis. Other comorbidities are also associated with psoriasis, such as cardiovascular disease (CVD) and metabolic syndrome (MetS) and its components, including obesity, hypertension, diabetes mellitus and dyslipidaemia.

Table 1. Summary of recommendations for the management of moderate-to-severe psoriasis: phototherapy and systemic therapy.[31,32]

Summary of recommendations for treatment with phototherapy	
Phototherapy regimens	**Level, grade**
Topical/bath PUVA	Level 2++, B
Excimer light	2+, C
PUVA + acitretin	Level 1+, B
NBUVB	Level 1+, A
UVB + MTX	Level 1+, A
UVB + acitretin	Level 1+, A
UVA + biologics	Level 2+, C
UVB + apremilast	Level 2+, C
Summary of recommendations for treatment with systemic therapy	
Treatment modality is guided by severity, impact on QoL and the presence of cutaneous psoriasis elsewhere and psoriatic arthritis.	GPP
MTX* is an inexpensive and effective drug for both psoriatic arthritis and psoriasis and can be combined with phototherapy.	1+, A
Acitretin* is not immunosuppressive and may be used effectively as monotherapy or combined with phototherapy	 2+, B 1+, A
Cyclosporine* is a fast-acting and highly effective drug for psoriasis.	1+, A
Hydroxyurea may be considered for chronic plaque psoriasis and generalised pustular psoriasis with >20% BSA in patients with adverse events or comorbidities, precluding the use of conventional oral systemics and biologics.	3, C
Apremilast is not immunosuppressive and is an effective systemic agent for the management of plaque psoriasis, psoriatic arthritis and palmoplantar psoriasis.	1+, A
The primary aim of systemic treatment is to achieve clearance of psoriasis. If the primary aim is not achievable, the next aim should be to improve the extent of disease and QoL of patients by achieving the following treatment targets: PASI reduction by 75% (with newer biologics, PASI reduction by 90% or PGA 0/1 may be achieved in highly motivated patients) or DLQI <5 or DLQI reduction by a minimum of 5 points.	4, D
Definition of standard systemic therapy: cyclosporine 2–5 mg/kg/day for 12 weeks; MTX 15–25 mg weekly for 12 weeks; acitretin 25–50 mg daily for 12–24 weeks and definition of adequate response to therapy: PASI reduction by 75% or DLQI <5 or DLQI reduction by at least 5 points.	4, D
Systemic treatment in erythrodermic psoriasis (1) Cyclosporine: for unstable cases, because of its rapid onset of action (2) Acitretin or MTX in less acute disease	 2+, B 2+, B

*Systemic agents commonly used in Singapore.
BSA: body surface area; DLQI: Dermatology Life Quality Index; GPP: good practice points; MTX: methotrexate; NBUVB: narrow-band ultraviolet B; PASI: Psoriasis Area and Severity Index; PGA: physician global assessment; PUVA: Psoralen + UVA; QoL: quality of life; UVA: ultraviolet A

Indications for referral to specialists

A patient should be referred to a dermatologist when: (1) the patient presents with a complex disease, i.e. an extensive disease that is likely to require systemic treatment, with BSA >10%; (2) the disease is associated with significant psychological distress, e.g. DLQI >5 or less than a 5-point reduction compared with baseline after treatment; (3) the patient is unsatisfied with the current level of control; (4) the patient exhibits suboptimal response to primary care management, i.e. less than 75% reduction in BSA involvement or PASI; or (5) the patient develops significant adverse effects to topical medications, e.g. skin atrophy, striae, hirsutism

Table 2. Summary of recommendations for biologics in the management of moderate-to-severe psoriasis and in special situations.[5,31-35]

Recommendations	Level/grade
Pre-biologic evaluation	
Pre-biologic assessments include: Disease severity • PASI (or BSA and PGA) • DLQI Exclude contraindications Cardiovascular • 2D echocardiography if heart failure based on NYHA class III/IV (anti-TNFs) Neurologic • Exclude demyelination in personal or first-degree relatives in the family history (anti-TNFs) Infections • Exclude active or chronic infections Tuberculosis • Screen for active or latent TB by clinical and diagnostic investigations Malignancy • Refer to primary care physicians for age- and sex-appropriate cancer screening if indicated **Tests** • FBC, creatinine, LFT, HBsAg, HBsAb, and HBcAb, anti-hepatitis C IgG and CXR • IGRA (e.g. T-SPOT®.TB or QuantiFERON®-TB Gold). Mantoux test may be more difficult to administer and interpret and less reliable in patients already on immunosuppressants. • HIV screening if clinical suspicion of HIV exists • Urine pregnancy test (if at risk) **Financial counselling and assessment** Patients must be informed regarding the cost of the biologic therapy. When the cost of therapy is an issue, subsidised patients in restructured hospitals who meet the medical criteria for biologics under SDL or MAF should be assessed for financial assistance. SDL biologics: adalimumab biosimilar and infliximab biosimilar MAF biologics: secukinumab and ixekizumab	4, C
Monitoring on biologics	
An IGRA is conducted annually. If too costly or not available, CXR can be considered as an alternative.	GPP
FBC and LFT at 4 weeks (2 weeks for infliximab) and then 3–6 monthly	2+, B
Creatinine: 6 monthly	2+, B
Hepatitis B, Hepatitis C, HIV, periodic urine pregnancy test, if at risk	2+, B
Switching from nonbiologic systemic therapy to biologic therapy in the management of moderate-to-severe psoriasis	
General considerations • When switching due to safety reasons, a washout period is desirable until the safety parameter is stabilised or normalised. • An overlap period or a direct transition may be considered if the switch is due to a lack of efficacy. • An approved induction dose must be used when initiating biologic therapy.	3, D
Switching from acitretin • It does not need a washout period. • Contraception must be continued in women of childbearing age for 3 years.	3, D
Switching from cyclosporine • It does not require a washout period. • A brief overlap period along with biologic therapy (such as for 2–8 weeks) could be considered to reduce the risk of rebound in partial responders. However, the dose of cyclosporine should be tapered at the earliest.	3, D
Switching from MTX • It does not require a washout period. • MTX to be used concomitantly or may be overlapped with approved biologics.	3, D

Table 2. Summary of recommendations for biologics in the management of moderate-to-severe psoriasis and in special situations.[5,31-35] (Cont'd)

Recommendations	Level/grade
Switching between biologics	
General considerations	
• It is generally recommended to fully optimise a biologic before switching to another.	
• In cases where efficacy is lost over time (secondary non-responders) or the patients do not respond adequately (do not achieve a minimum of PASI75) by the end of the induction phase (primary non-responders), switching must be performed with considerations to dose adjustments.	
• A washout period is necessary when safety concerns are the reason for switching until the safety parameter is stabilised or normalised.	
• A washout period is unnecessary when the reason for switching is a lack of efficacy; a switch can be made to the new biologic when the next dose of the original therapy is scheduled.	
• A maintenance dose must follow after the approved induction dose for the new biologic.	3, C
• Patients failing to respond to a biologic may respond to another biologic (even if the biologic belongs to the same class as the previous one, e.g. anti-TNF).	4, D
• If a response is achieved to the biologic therapy, then a standard therapy must be rationalised (e.g. dose reduced or stopped).	4, D
• MTX and acitretin (limited data for the latter) do not show increased toxicity when combined with anti-TNFs.	
How to stop biologics?	
Biologics may be stopped abruptly if required.	4, D
Continuous therapy is more efficacious and associated with less development of antidrug antibodies (with associated loss of efficacy and side effects).	3, C
Biologic therapy in special situations	
Surgery	
• The risk of a psoriatic flare needs to be balanced with the advantage of postoperative infection prevention achieved by stopping the treatment.	4, D, GPP
• When wound healing is optional and there is no sign of infection, then biologics may be restarted postoperatively.	4, D, GPP
Retreatment after stopping biologics	
• Continuous therapy is more efficacious than interrupted therapy, but situations may arise where patients need to interrupt treatment and restart again later.	4, D, GPP
• Etanercept, adalimumab, ustekinumab, secukinumab, guselkumab and risankizumab: most patients regain their initial response on retreatment.	
Drug interactions	
• In patients on immunosuppressives, biologics should be used with great caution and concomitant use should be avoided if possible.	4, D, GPP
Pregnancy	
• Patients planning conception should discuss with their dermatologist the benefits versus risks of continuing biologic treatment during pregnancy. Certolizumab pegol has minimal placental permeability and is the safest and preferred biologic treatment option throughout pregnancy.	
• Certolizumab is an unregistered therapeutic product in Singapore and if required, drug approval should be obtained via the special access route. Other biologics may be used with caution in pregnancy, with TNF-alpha inhibitors as the preferred class.	4, D, GPP
• If TNF-alpha inhibitors or other biologic therapies (excluding certolizumab) are given after week 22 of pregnancy, live vaccines, such as BCG, should be delayed until the infant is more than 6 months old.	

2D: two dimensional; BCG: Bacillus Calmette-Guerin; BSA: body surface area; CXR: chest X-ray; DLQI: Dermatology Life Quality Index; FBC: full blood count; GPP: good practice points; HBcAb: Hepatitis B core antibody; HBsAb: Hepatitis B surface antibody; HBsAg: Hepatitis B surface antigen; HIV: human immunodeficiency virus; IgG: immunoglobulin G; IGRA: interferon-gamma release assay; LFT: liver function test; MAF: medication assistance fund; MTX: methotrexate; NYHA: New York Heart Association; PASI: Psoriasis Area and Severity Index; PGA: Physician Global Assessment; SDL: standard list; TB: tuberculosis; TNF: tumour necrosis factor

Table 3. Summary of treatment recommendations for generalised pustular psoriasis, palmoplantar pustular psoriasis and impetigo herpetiformis.

Recommendations	Generalised pustular psoriasis (level, grade)	Palmoplantar pustular psoriasis (level, grade)	Impetigo herpetiformis (level, grade)
Topical corticosteroids	3, D	2+, C	NA
Topical calcipotriol	3, D	NA	NA
Topical tacrolimus	3, D	NA	NA
Phototherapy	2+, C	2+, C	NA
MTX	2+, C	2+, C	NA
Acitretin	2+, C	1+, A	NA
Cyclosporine	2+, C	1+, A	3, D
Adalimumab	2+, C	2+, C	3, D
Infliximab	2+, C	2+, C	3, D
Secukinumab	2+, C	NA	3, D
Ixekizumab	2+, C	NA	3, D
Ustekinumab	NA	2+, C	NA
Guselkumab	2+, C	1+, A	NA
Etanercept	3, D	1+, A	NA

MTX: methotrexate; NA: not applicable

and steroid-induced acne. Referral to a dermatologist might also address the need for urgent in-patient care—when the patient presents with generalised pustular psoriasis, erythrodermic psoriasis or acute unstable psoriasis.[36]

Addressing poor adherence to treatment

The presence and extent of adherence should be routinely monitored by questioning the patients directly. The top 3 causes of poor adherence to topical agents for psoriasis management are low efficacy, time consumption and inadequate cosmetic characteristics.[37] Some of the strategies to improve adherence are listed below.

Patients should be provided with information about psoriasis, such as through patient information leaflets or websites, including resources like the Psoriasis Association of Singapore (http://www.psoriasis.org.sg/), DSS (https://www.dermatology.org.sg/education/ psoriasis/) and NPF (https://www.psoriasis.org/). The social impact of psoriasis should be recognised, which may include addressing emotional and psychological aspects alongside physical symptoms. Patients should be informed about the potential side effects of topical therapies. Frequent and regular follow-up visits are highly recommended, especially in the initial stage of treatment, to monitor progress, adjust the treatment plan as needed and address any concerns or issues that may arise.[38]

Considerations in PsA

PsA, affecting approximately 20% of those with psoriasis, is a chronic inflammatory condition marked by substantial morbidity and a notable impact on quality of life.[2] Screening tools and diagnostic approaches are crucial in the effective management of PsA, facilitating early identification and appropriate referral to rheumatologists.

Screening tools

Screening tools for PsA have been developed to help dermatologists identify patients for referral to rheumatologists. The Psoriasis Epidemiology Screening Tool (PEST)[39] was chosen, as it can be completed rapidly by patients and has good sensitivity.

Diagnosis

There is a lack of serum biomarkers and specific laboratory tests for PsA. Erythrocyte sedimentation rate, fibrinogen levels and C-reactive protein may not always be increased, even in individuals with active disease.[40] Rheumatoid factor and anti-cyclic

citrullinated peptide antibodies are absent in about 95% of patients with PsA. If present, it is desirable to use clinical features and imaging features for differentiating PsA from rheumatoid arthritis.[41] Human leukocyte antigen (HLA)-B*27 can identify patients with psoriasis more prone to develop PsA or for the early diagnosis of PsA when inflammatory back pain is present.[42]

Imaging features

Destruction of cartilage and bone along with new pathological bone formation is the hallmark of PsA on a radiograph.[41] This simultaneous joint destruction and formation is unique to PsA.

- Spondylitis and sacroiliitis in PsA can mimic ankylosing spondylitis (AS). However, the development of non-marginal syndesmophytes, unilateral sacroiliitis and asymmetry of syndesmophytes may distinguish PsA from AS.
- Ultrasonography may be performed to check for enthesitis.
- Magnetic resonance imaging may provide information on bone marrow edema in axial and peripheral structures, such as entheses, synovitis and focal erosions.

Referral to a rheumatologist

Early identification and treatment of PsA can prevent irreversible joint damage. As primary care providers for patients with psoriasis, dermatologists play a pivotal role in providing holistic treatment nd, where appropriate, organising multidisciplinary care.

The following clinical features may predict more severe disease outcomes in PsA, and co-management with a rheumatologist may be considered:[43] female sex, older age at diagnosis, obesity, smoking history, longer disease duration, higher baseline disease activity (≥5 affected joints and/or elevated inflammatory markers), presence of dactylitis or nail involvement, and worse baseline physical function.

The treatment for PsA encompasses conventional step-up strategies, initially utilising topical therapies for psoriasis and conventional synthetic disease-modifying antirheumatic drugs for arthritis. However, it also includes accelerated treatment pathways, where biologic DMARDs or targeted synthetic DMARDs may be employed as first-line therapy, if accessible and deemed appropriate.[2]

A summary of recommendations for PsA screening, referral and management is presented in Table 4.[44-46]

Psoriasis in special populations and comorbidities

Pregnant and lactating women

Topical medication is usually the preferred treatment for psoriasis in pregnant and lactating women. As medications pass through the placenta and are found in breast milk in varying concentrations, they should be used with caution. Common psoriasis treatments, the descriptions of their use in pregnancy and lactation, their effects on fertility, and their earlier United States Food and Drug Administration (USFDA) categories are elaborated in Supplementary Table S2.[19-30]

Adalimumab and certolizumab may be acceptable in pregnancy, with certolizumab being the preferred biologic and safe in lactation. They may be given after consideration of the risk–benefit ratio and should be individualised.[35] If TNF-alpha inhibitors or other biolo-gic therapies (excluding certolizumab) are given after week 22 of pregnancy, live vaccines such as Bacillus Calmette-Guerin (BCG) should be delayed till after the infant is more than 6 months of age.[47]

Children

Psoriasis affects around 1% of children and most commonly occurs during adolescence. Chronic plaque psoriasis is the most observed presentation in children, with sites such as the scalp, elbows and knees or skinfolds (i.e. those behind the ears, armpits and groin) being the most affected. Children with psoriasis may present with comorbidities, such as obesity, MetS and PsA.[48] Factors that are taken into account when selecting suitable treatments for psoriasis in the paediatric population are the safety profile, dosing schedule and approval of the drug in the paediatric population.

Methotrexate (MTX), cyclosporine (CyA) and acitretin, although not USFDA-approved for paediatric psoriasis, can be considered for shortterm and intermittent usage.

Combining biologics with topical corticosteroids, with or without a vitamin D analogue, is a safe option for treating moderate-to-severe plaque psoriasis in children.

Adalimumab has been approved by Singapore's Health Sciences Authority (HSA). Children aged ≥4 years and weighing ≥30 kg are initially administered a dose of 40 mg at week 0, followed by a maintenance dose of 40 mg every 2 weeks. For children weighing between 15 kg and 30 kg, the initial dose is 20 mg at week 0, followed by a maintenance dose of 20 mg every 2 weeks.[9,48]

Table 4. Summary of recommendations for psoriatic arthritis screening, referral and management.[44-46]

Recommendations for PsA: Screening and referral	Level, grade
All patients with psoriasis should be assessed initially and then at least annually for signs and symptoms of PsA.	GPP
Patients with clinical predictors of worse PsA outcomes warrant more intense monitoring and treatment, including multidisciplinary care, to prevent the development of irreversible joint damage.	GPP
The choice of therapy should be individualised and take into consideration the chief PsA domain affected and the severity of cutaneous psoriasis.	GPP
Treatment recommendations: Non-pharmacological therapies	
Patient education, physical therapy, exercise, weight loss and smoking cessation are the essential and integral components of PsA management. Patients with active PsA must be recommended to utilise some form of or a combination of occupational therapy, exercise and physical therapy. Low-impact exercise is preferred over high-impact exercise.	2+, D
Treatment recommendations: Pharmacological therapies	
Pharmacological therapies may be classified as:	
csDMARDs: e.g. MTX (Level 2+, C), sulfasalazine (Level 1−, C), leflunomide (Level 2+, C) and cyclosporine (Level 2−, D)	2+, C
bDMARDs: e.g. biological agents targeting cytokines, such as TNF, IL-12/23, IL-17A and IL-23	1+, A
Biologic DMARDs have higher levels of evidence compared with conventional synthetic DMARDs and are more effective, especially for axial PsA.	1+, A
PDE-4 inhibitor: e.g. apremilast	1+, A
Others: NSAIDs and glucocorticosteroids (intra-articular or systemic) NSAIDs and intra-articular corticosteroids are useful in the treatment of PsA symptoms.	1−, B
Systemic corticosteroids should only be used sparingly at the lowest dose necessary for short durations.	1−, C
Treatment recommendations according to different domains for PsA	
Peripheral arthritis • NSAIDs may be used for symptomatic relief for patients with mono/oligoarticular disease (≤4 joints) and the absence of risk factors for poor prognosis (e.g. dactylitis or joint damage). • Intra-articular corticosteroids may be used as an adjunctive therapy. Systemic corticosteroids should only be administered, if absolutely necessary, for short periods of time and at the minimum dose required for efficacy (commonly <7.5 mg/day) to reduce adverse effects, including psoriasis flare upon stopping the treatment. • Where there is polyarthritis (>4 joints) or the presence of poor prognostic factors, csDMARDs or bDMARDs should be used as first-line therapy or after only a short course of NSAIDs (<2 weeks). If axial or entheseal involvement is prominent, early use of bDMARDs is suggested as csDMARDs are not effective in such conditions. • Among the csDMARDs, MTX is highlighted for its wide experience of use and demonstrated efficacy in control arms of multiple clinical trials of PsA. Other csDMARDs, such as leflunomide and sulfasalazine, have limited efficacy in skin psoriasis. • If there is inadequate response or intolerance to an initial csDMARD or bDMARD, co-management with a rheumatologist should be considered.	1−, B
Axial PsA • NSAID monotherapy is used as first-line therapy, and the duration of treatment may be prolonged (up to 12 weeks, provided there is symptom relief by 4 weeks). • csDMARDs are generally ineffective in axial disease. In the event of inadequate response to NSAIDs, it is recommended that a bDMARD be considered, which in current practice is usually a TNF inhibitor or an IL-17 inhibitor.	1−, C
Enthesitis • NSAIDs and local corticosteroid injections are first-line therapies. csDMARDs are generally not efficacious. A bDMARD may be used in case of inadequate response, intolerance or contraindication to NSAIDs.	2++, C
Dactylitis • csDMARDs and bDMARDs may be used in dactylitis. NSAIDs have not demonstrated efficacy.	1−, C

bDMARD: biological disease-modifying antirheumatic drug; csDMARD: conventional synthetic disease-modifying antirheumatic drug; DMARD: disease-modifying antirheumatic drug; GPP: good practice points; IL: interleukin; MTX: methotrexate; NSAID: nonsteroidal anti-inflammatory drug; PDE-4: phosphodiesterase-4; PsA: psoriatic arthritis; TNF: tumour necrosis factor

Secukinumab has demonstrated high efficacy in alleviating skin symptoms and enhancing the health-related quality of life in paediatric patients (aged 6 to 17 years)[3] with severe chronic plaque psoriasis while maintaining a favourable safety profile.[49] For plaque psoriasis treatment in paediatric patients aged 6 years and above, the subcutaneous administration of the drug dose based on weight is recommended. Injections should be given at weeks 0, 1, 2, 3 and 4, followed by every 4 weeks thereafter. Patients weighing less than 50 kg (when dosing) should receive a dose of 75 mg. Patients weighing 50 kg or more (when dosing) should receive a dose of 150 mg, which may be increased to 300 mg monthly.[49,50]

Ixekizumab, which targets interleukin (IL)-17A selectively, can be used in paediatric patients (aged 6 to <18 years) with moderate-to-severe psoriasis.[51] It shows a similar safety profile to that of adults. Patients weighing over 50 kg should receive a recommended dose of 160 mg (2 80 mg injections) at week 0, followed by a dose of 80 mg every 4 weeks. Patients weighing between 25 kg and 50 kg are recommended a dose of 80 mg at week 0, followed by a dose of 40 mg every 4 weeks.[51,52] Ustekinumab can be administered subcutaneously (60 kg: 0.75 mg/kg/dose; 60 kg to ≤100 kg: 45 mg; 100 kg: 90 mg) at weeks 0 and 4, and then every 12 weeks, in children aged 12 to 17 years for the treatment of psoriasis.[21,53,54]

Elderly

Comorbidities, such as hyperlipidaemia, hypertension and type 2 diabetes, are more common in elderly patients. Therefore, the utilisation of systemic therapies may be restricted in this population. Drug interactions can also occur between psoriasis drugs, and concomitant medications can precipitate or aggravate psoriasis.[55,56]

The primary goals are to clinically control the disease with safe and tolerable treatment modalities, satisfy patients' expectations and improve their quality of life. Topical corticosteroids and topical vitamin D analogues are first-line treatments for mild psoriasis under appropriate guidance.[55] Caution must be exercised with topical corticosteroids due to their known cutaneous side effects.[55]

Narrow-band UVB, acitretin, MTX and biologics are advised as first-line treatment options in elderly patients with extensive psoriasis. Newer IL-23 and IL-17 therapies with higher efficacy are other promising options for the elderly.[56]

Dermatological drugs mainly excreted by the kidneys (e.g. MTX) may be eliminated more slowly in the elderly. Therefore, it is desirable to consider a dose reduction. MTX is also hepatotoxic, and caution must be exercised while prescribing this drug in the elderly.[55] In case of extensive disease, CyA is preferred as a second-line systemic treatment.[55]

Despite the availability of many effective systemic treatments for psoriasis, deciding the treatment approaches for specific populations with psoriasis, such as patients with TB, HIV, hepatitis, malignancies or surgical patients, can be challenging. These groups are typically not included in clinical trials, and very few up-to-date reviews on psoriasis management in these populations are available.

TB

Patients with psoriasis on treatment with immunosuppressant medications are at a high risk of activating latent TB infection (LTBI). However, acitretin is well-tolerated in patients with LTBI.[10]

The gap between the initiation of biologic therapy for psoriasis and the development of clinical signs of TB or the confirmation of TB diagnosis may range from 3 to 12 months.[57] If the screening result or TB status is unclear or LTBI is suspected, therapy with biologics should not be initiated without consultation with a relevant physician (e.g. physicians specialising in infectious or respiratory diseases). The 2 preferred regimens for the treatment of TB infection in adults are rifampicin daily for 4 months (4R), or isoniazid daily for either 6 or 9 months (6H/9H).[58] Treatment with a biologic may be initiated as early as possible, typically 1 month after initiating prophylaxis for TB. If there is a suspicion of TB reactivation that is justified or a new infection during biologic therapy, the interferon-gamma release assay and chest X-ray should be repeated.

Treatment with TNF-α inhibitors and ustekinumab can be considered in individuals with LTBI after appropriate TB prophylaxis.[59] The risk of TB reactivation in patients with psoriasis and LTBI remains less with the use of IL-17 or IL-23 inhibitors. Hence, in cases where concerns about TB reactivation arise, prioritising IL-17 or IL-23 inhibitors over TNF-α inhibitors is recommended.[6]

HIV infection

Fundamental therapy of HIV with antiviral medications, such as highly active antiretroviral therapy (HAART), may have additional beneficial effects on dermatological lesions, such as complete or nearly complete symptom clearance in up to 90% of patients with HIV-associated psoriasis. Immunocompetent HIV patients may be treated with nearly all the therapeutic agents that can be used in an HIV-negative psoriasis patient provided there are no adverse interactions with HAART, if any. Treatment options include topicals (Level 1+,

A), phototherapy (Level 2+, B), retinoids (Level 3, B), MTX (Level 4, D), CyA (Level 4, D) and biologics (Level 3, B).

Hepatitis

Hepatitis B

Screening should be done for Hepatitis B surface antigen (HBsAg) before starting the treatment with MTX, CyA and biologics in patients with psoriasis; screening for anti-HB antibodies is recommended. Patients should not be managed with immunosuppressive therapies in the acute hepatitis stage. However, treatment with biologics may be considered in patients presenting with resolved or chronic hepatitis under close supervision and in consultation with a gastroenterologist.

Recommendations for HBsAg-positive patients with psoriasis

It is advisable to avoid administering biologics to patients who are positive for HBsAg. Topicals, phototherapy, acitretin and apremilast should be considered. The screening for hepatitis B and C is not required for the initiation of apremilast, but drug cost and access may be prohibitive. Considerations for starting oral agents and biologics should be in consultation with gastroenterology. Input is required for choice of drug due to individual risk of liver fibrosis (e.g. acitretin),[60] hepatitis B reactivation risk, comorbidities and initiation of prophylaxis if indicated. Inactive HBV carriers (HbsAg-positive, HBcAb-positive, HBV DNA<2000 IU/mL, acceptable transaminases) may be started on biologics with lower risk of HBV reactivation under prophylactic anti-HBV therapy.[61] Antiviral therapy is suggested to commence either at the same time or 1 to 2 weeks before biologics.[7] Reactivation of the HBV typically manifests during immune reconstitution, necessitating the continuation of antiviral therapy for 6 to 12 months following the cessation of immunosuppression.[61] Prophylaxis is recommended with close monitoring through laboratory tests, including assessments of liver function and HBV DNA viral load.

Among HBsAg-positive patients, acitretin, apremilast,[61] IL-17 inhibitors and IL-23 inhibitors[60] are considered low-risk for HBV reactivation (<1%) but still require monitoring for viral reactivation with transaminases and HBV DNA.[61] Higher potency TNF inhibitors (infliximab, adalimumab, certolizumab[62]) are considered high risk for reactivation (>10% risk level); ustekinumab,[63] etanercept[62] and cyclosporine[61] are moderate risk (1%–10%). While the use of MTX and CyA is contraindicated or relatively contraindicated in most guidelines, acitretin may be used along with monitoring of LFTs.

Recommendations for anti-HBc-positive patients with psoriasis

Before initiating treatment with CyA and biologics in patients with past hepatitis B exposure (anti-HBc-positive, HBsAg-negative patients), screening for HBV DNA load is recommended. The risk of reactiva-tion for anti-HBc-positive, HBsAg-negative and HBV DNA-negative patients is lower than for HBsAg-positive patients. Such patients treated with TNF-α inhibitors, ustekinumab and CyA are associated with a moderate risk of HBV reactivation and should be monitored with transaminases and HBV DNA. MTX, acitretin or apremilast are associated with a minimal risk of reactivation and thus do not necessitate anti-HBV therapy. Patients on biologics and cyclosporine should be offered gastroentero-logy review with the option of antiviral prophylaxis on a case-by-case basis.

Hepatitis C

About 80% of patients with acute hepatitis C may develop chronic hepatitis C infection, defined as detectable viral replication for at least 6 months. [60] Liver enzymes could be normal in around 50% of patients with chronic hepatitis C. Recommendations for the management of these patients include serology before the initiation of treatment with MTX, acitretin, CyA and biologics and consultation with a gastroenterologist. Oral direct-acting antivirals are safe and effective treatment against hepatitis C and have high rates of sustained virological response.[64] Apremilast and IL-17 inhibitors seem to have a favourable safety profile for psoriasis. However, data are scarce, including data on the safety of IL-23 inhibitors in patients with hepatitis. MTX should be avoided in patients with chronic hepatitis. CyA use in chronic hepatitis is not well established.[57,59]

MetS (hypertension/hyperlipidaemia/diabetes mellitus/obesity)

Beyond dermatological symptoms, systemic inflammation observed in psoriatic patients contributes to the phenomenon known as the psoriatic march. This suggests that inflammatory processes extending from the skin to systemic levels in psoriatic patients may trigger immune-mediated changes, leading to significant comorbidities, such as metabolic disorders (including obesity, hypertension and dyslipidaemia) and CVDs.[11]

The occurrence of MetS is potentially 3-fold higher among individuals with psoriasis than in the overall populace, potentially influencing the preferred treatment options for specific patients.[8]

Multiple studies have identified a strong association between psoriasis and CVD. The American Heart Association and the American College of Cardiology have classified psoriasis as a condition that enhances the risk of atherosclerotic CVD. Annual metabolic screening for blood glucose or glycated haemoglobin, lipid levels, blood pressure and obesity (body mass index and/or waist circumference) should be included as part of the dermatological follow-up for patients with psoriasis. In addition, patient education regarding the cardiovascular risks associated with psoriasis should be provided during their follow-up appointments. Patients with diagnosed metabolic disorders or smoking should be advised on risk factor modification and to attain treatment targets.[8]

Malignancy

As several systemic therapies indicated in psoriasis are associated with an elevated risk of de novo or reactivated malignancies, caution is needed while choosing a therapeutic option for patients with a history of solid tumours. The staging and type of cancer, the burden of psoriasis, and the risk of recurrence of melanoma skin cancer and non-melanoma skin cancer (NMSC) have been recently diagnosed. Phototherapy (UVB 308 nm, UVB 311 nm), topical therapy and/or therapy with acitretin are recommended.[57] Preventative effects are observed with acitretin on NMSC. Thus, they are preferred in patients with an elevated risk for skin cancers. If possible, it is desirable to avoid CyA and MTX in this kind of setting.[65] It is also advised to avoid biologics in patients with a recent or recurrence of malignancy unless the likelihood of cure is high (including adequately treated NMSC) and/or the malignancy was diagnosed and managed more than 5 years ago. If the malignancy is less than 5 years post-remission, biologics should be considered in consultation with an oncologist.

Surgery

The likely advantage of postoperative infection prevention by the discontinuation of psoriasis treatment needs to be balanced with the risk of a psoriatic flare (Level 4, Grade D, good practice

Table 5. Summary of treatment recommendations in patients with comorbidities and on delivery of care, and social and psychological aspects of psoriasis.[36,66,67]

Recommendations for patients with psoriasis with a risk of comorbid conditions	Level, grade
Psoriatic arthritis should be considered in all patients with cutaneous psoriasis. Patients with signs and symptoms suspicious of psoriatic arthritis must be completely evaluated for psoriatic arthritis.	3, B
Patients with psoriasis must be screened actively for cardiovascular risk factors.	2–3, B
Patients with moderate-to-severe psoriasis should have their obesity status determined according to the national guidelines.	2–3, B
Patients with psoriasis should be actively screened for metabolic syndrome and its components by an appropriate healthcare professional according to the national guidelines.	2–3, B
Recommendations for patients with psoriasis with comorbid conditions	
Obese and overweight patients with psoriasis should be counselled regarding weight loss and the impact of weight on psoriasis severity as well as on the treatment response.	2–3, D
Acitretin and MTX should be used with caution in patients with psoriasis having liver disease.	4, D
Patients with IBD must avoid interleukin-17 inhibitor therapy.	1–3, C
Lifestyle interventions, such as smoking cessation and weight loss, should be encouraged in patients with psoriasis who are current smokers or are obese. A referral for smoking cessation or weight management programmes may be considered if appropriate.	4, D
Recommendations on delivery of care and social and psychological aspects of psoriasis	
Patients with acute unstable psoriasis, erythrodermic psoriasis and generalised pustular psoriasis should be urgently referred to a dermatologist for consideration of inpatient management.	4, D (GPP)
Patients must be provided clear instructions regarding the use of topical agents and therapeutic education to improve adherence.	1+, A
Patients with psoriasis should be followed up regularly and frequently, especially in the initial stages of treatment.	2+, C

GPP: good practice points; IBD: inflammatory bowel disease; MTX: methotrexate

Table 6. Treatment recommendations for children with psoriasis.[48]

Topical treatments and phototherapy: Treatment recommendations
• An ointment of tacrolimus 0.1% may be recommended as an off-label use monotherapy for paediatric psoriasis of the genital region and the face.
• A combination of betamethasone dipropionate 0.064% and calcipotriol 0.005% is recommended in patients ≥12 years of age for scalp and body psoriasis.
• Calcipotriol may be recommended as an option for the management of childhood plaque psoriasis. However, its application is not recommended in large body surface areas.
• Rotational therapy with topical corticosteroids, tar-based therapies, emollients, topical calcineurin inhibitors and topical vitamin D analogues can be considered to avoid the adverse effects of continuous long-term steroid-based therapy.
• Coal tar preparations when combined with other topical therapies or as monotherapy may be used.
• Narrow-band UVB may be recommended as an option to manage guttate psoriasis and moderate-to-severe paediatric plaque.
Nonbiologic systemic treatments: Treatment recommendations
• MTX may be the recommended systemic therapy effective in managing moderate-to-severe plaque psoriasis and other subtypes in children.
• Cyclosporine may be the recommended effective systemic therapy in moderate-to-severe plaque psoriasis in children. However, during treatment, it is recommended to monitor the blood pressure routinely.
• Acitretin may be recommended as an effective, non-immunosuppressive systemic therapy for children with extensive guttate or moderate-to-severe psoriasis vulgaris and pustular psoriasis. However, caution should be exercised while administering long-term acitretin therapy to children because of the decreased bone mineral density, formation of periosteal bone, calcification of anterior spinal ligaments, hyperostosis resembling diffuse idiopathic skeletal hyperostosis, and potential risk of premature epiphyseal closure.
Biologic therapy: Treatment recommendations
• Adalimumab 0.8 mg/kg (maximum, 40 mg) may be administered at weeks 0 and 1 and every other week, off-label, to effectively manage adolescents and children with moderate-to-severe psoriasis.
• Infliximab 3.3–5 mg/kg may be administered at weeks 0, 2 and 6 and then every 8 weeks in combination with MTX or as monotherapy, for off-label use, in the case of severe plaques or pustular psoriasis in the paediatric population.
• Alternative biologics include ustekinumab, secukinumab, ixekizumab and etanercept.

MTX: methotrexate; UVB: ultraviolet B

points). In the case of minor surgeries, such as those involving skin or dental structures, any treatment that is systemic may be continued. Before major surgeries, it is desirable to discontinue treatment with systemic immunosuppressives and restart in the absence of postoperative infection.[21] Stopping biologics, in consultation with the surgeon, should also be considered. If there is an intent for the biologics to be eliminated from the system, it should be stopped for at least 2 to 5 half-lives before the surgery and each patient profile and associated morbidity must be considered.[21]

Table 5 presents the summary of recommendations for patients with psoriasis with a risk of comorbidities and patients with psoriasis with comorbid conditions, as well as delivery of care and social and psychological aspects of psoriasis.[36,66,67] Table 6 presents the summary of treatment recommendations for children with psoriasis.[48]

Considerations for vaccination

While on treatment with systemic immunosuppressants/biologics, vaccination requires special care. Vaccine counselling is an essential component of the treatment plan for psoriasis. Patients should be up-to-date on all immunisations, as recommended by local guidelines.[68]

The following groups should not receive live vaccines:[30] (1) patients on systemic immunosuppressants/biologics, and (2) infants up to 6 months of age whose mothers had received biologic treatment beyond 22 weeks of gestation (except certolizumab).[47]

If live vaccination is needed, then it should be administered after stopping the biologics therapy for at least 3 half-lives. Live attenuated zoster vaccine should not be given while on biologics. The recombinant zoster vaccine (SHINGRIXÔ), an inactivated vaccine, can be given while on biologics. In general, systemic immunosuppressants/biologic treatment can be started at least 4 weeks after the administration of a live vaccine.[36] Recommendations on when to administer live vaccines based on biological half-life are given in Supplementary Table S3.[30]

Inactivated vaccines can be given while on systemic immunosuppressants/biologics and, where possible, may be given at least 2 weeks before initiation for an optimal immune response. Response to vaccines is normal or slightly impaired while

on systemic immunosuppressants/biologics.[36] Live vaccines are to be avoided during systemic immunosuppressants/biologic treatment, including measles–mumps–rubella vaccination, varicella, rotavirus, BCG, yellow fever, oral typhoid and oral polio.[53]

Limitations of guidelines

These guidelines represent the best evidence at the time the project commenced. The field of therapeutics for psoriasis is rapidly advancing, and the findings from forthcoming studies may necessitate altering the recommendations mentioned in this report.

Treatment should be tailored to individual patients and their specific circumstances. It may be necessary to deviate from these guidelines in specific patients or in special circumstances. Adherence to guidelines may not serve as a defence in a negligence claim. Similarly, deviation from the recommendations should not be considered as negligence.

These guidelines take into consideration the financial implications of treatment, medical assistance and funding. However, there may be changes in these schemes, the clinical evidence surrounding these medications, and side effect profiles when more data emerge.

Guidelines are based on a literature search until December 2019, supplemented with key updates till 31 December 2023. However, newer biologics (guselkumab, risankizumab and spesolimab) and oral deucravacitinib were not included as they received HSA approval after the 2019 literature review and not included as part of the consensus voting and discussion. Published data beyond this date may be a topic for consideration in future guidelines.

CONCLUSION

The practical guidelines developed by the members of the DSS Psoriasis Therapeutic Guidelines Workgroup outline evidence-based recommendations in an easy-to-read format. This can help prescribing dermatologists in achieving good outcomes when managing their patients.

Supplementary materials

Table S1. SIGN grading system: 1999–2012.[18]

Table S2. Common topical and nonbiologic systemic psoriasis medications and description for their use along with their earlier FDA categories.[19-30]

Table S3. Recommendations on when to administer live vaccine based on half-lives of biologics.[30]

Fig. S1. Flowchart explaining the process followed in formulating the guidelines.

Declaration

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