Contents

Appendix S1: PRISMA item checklist

Section and topic	Item #	Checklist item	Location where item is reported
Title			
Title	1	Identify the report as a systematic review.	Page 1
Abstract			
Abstract	2	See the PRISMA 2020 for Abstracts checklist (table 2).	Page 1
Introduction			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Paragraphs 1-4
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Paragraph 4
Methods			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Paragraph 7
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Paragraph 6
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Paragraph 6, Appendix p. 6
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Paragraphs 7-10
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Paragraphs 7-10

Section and topic	Item #	Checklist item	Location where item is reported
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Paragraphs 7-10
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Paragraphs 7-10
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Paragraph 9
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Paragraph 10
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Paragraph 10
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Paragraph 10
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Paragraph 10
	13d	Describe any methods used to synthesise results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Paragraph 10
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Paragraph 10
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesised results.	Paragraph 10
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Paragraph 9

Section and topic	Item #	Checklist item	Location where item is reported
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Paragraph 9
Results			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram (see fig 1).	Paragraph 11
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Appendix p. 16
Study characteristics	17	Cite each included study and present its characteristics.	Paragraph 11
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Paragraph 12
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Table 2, appendix S4-S5
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Paragraphs 12-26
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Paragraph 13, Figure 3
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Paragraphs 13 and 31
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesised results.	Paragraph 13
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Paragraph 12, appendix S3

Section and topic	Item #	Checklist item	Location where item is reported
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Paragraph 12, appendix S3
Discussion			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Paragraphs 27-33
	23b	Discuss any limitations of the evidence included in the review.	Paragraphs 27-30
	23c	Discuss any limitations of the review processes used.	Paragraph 31
	23d	Discuss implications of the results for practice, policy, and future research.	Paragraph 32
Other information			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Paragraph 4
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Paragraph 4
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Paragraph 4
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Paragraph 37
Competing interests	26	Declare any competing interests of review authors.	Paragraph 37
Availability of data, code, and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Paragraph 4, PROSPERO protocol

Appendix S2: PROSPERO protocol and updates

Systematic review

Please select one of the options below to edit your record. Either option will create a new version of the record - the existing version will remain unchanged.

A list of fields that can be edited in an update can be found here

1. * Review title. [1 change]

Give the title of the review in English

Immunogenicity, safety, usability, and acceptability of microarray patches for vaccination: a systematic review

2. Original language title.

For reviews in languages other than English, give the title in the original language. This will be displayed with the English language title.

3. * Anticipated or actual start date.

Give the date the systematic review started or is expected to start.

14/04/2022

4. * Anticipated completion date.

Give the date by which the review is expected to be completed.

14/01/2023

5. * Stage of review at time of this submission. [3 changes]

This field uses answers to initial screening questions. It cannot be edited until after registration.

Tick the boxes to show which review tasks have been started and which have been completed.

Update this field each time any amendments are made to a published record.

The review has not yet started: No

Review stage	Started	Completed
Preliminary searches	Yes	Yes
Piloting of the study selection process	Yes	Yes
Formal screening of search results against eligibility criteria	Yes	Yes
Data extraction	Yes	Yes
Risk of bias (quality) assessment	Yes	Yes
Data analysis	Yes	Yes

Provide any other relevant information about the stage of the review here.

6. * Named contact. [1 change]

The named contact is the guarantor for the accuracy of the information in the register record. This may be any member of the review team.

Matthew N. Berger

Email salutation (e.g. "Dr Smith" or "Joanne") for correspondence:
Mr Berger

7. * Named contact email.

Give the electronic email address of the named contact.

matthew.berger@sydney.edu.au

8. Named contact address

PLEASE NOTE this information will be published in the PROSPERO record so please do not enter private information, i.e. personal home address

Give the full institutional/organisational postal address for the named contact.

Specialty of Child and Adolescent Health, Faculty of Medicine and Health, The University of Sydney, Sydney, New South Wales, Australia

Centre for Population Health, Western Sydney Public Health Unit, North Parramatta, NSW, Australia

9. Named contact phone number.

Give the telephone number for the named contact, including international dialling code.

10. * Organisational affiliation of the review.

Full title of the organisational affiliations for this review and website address if available. This field may be completed as 'None' if the review is not affiliated to any organisation.

1 Specialty of Child and Adolescent Health, Faculty of Medicine and Health, The University of Sydney, Sydney, New South Wales, Australia

2 Centre for Population Health, Western Sydney Public Health Unit, North Parramatta, New South Wales, Australia

3 Sydney Institute of Infectious Diseases, The University of Sydney, Sydney, New South Wales, Australia

4 Sydney School of Public Health, Faculty of Medicine and Health, The University of Sydney, Sydney, New South Wales, Australia

5 Murdoch Children's Research Institute, Parkville, Victoria, Australia

6 Kids Research, Children's Hospital Westmead, Sydney Children's Hospital's Network, Westmead, New South Wales, Australia

Organisation web address:
http://www.sydney.edu.au

11. * Review team members and their organisational affiliations. [4 changes]

Give the personal details and the organisational affiliations of each member of the review team. Affiliation refers to groups or organisations to which review team members belong.
NOTE: email and country now MUST be entered for each person, unless you are amending a published record.

Mr Matthew N. Berger. Specialty of Child and Adolescent Health, Faculty of Medicine and Health, The University of Sydney, Sydney, New South Wales, Australia

Ms Ellen S. Mowbray. Specialty of Child and Adolescent Health, Faculty of Medicine and Health, The University of Sydney, Sydney, New South Wales, Australia

Dr Marian W. A. Farag.

Ms Claire Thomas. Centre for Population Health, Western Sydney Public Health Unit, North Parramatta, New South Wales, Australia

Dr Erin Mathieu. Sydney School of Public Health, Faculty of Medicine and Health, The University of Sydney, Sydney, New South Wales, Australia

Dr Cristyn Davies. Specialty of Child and Adolescent Health, Faculty of Medicine and Health, The University of Sydney, Sydney, New South Wales, Australia

Dr Angus H. Forster. Vaxxas Pty Ltd, Brisbane, Queensland, Australia

Professor Robert Booy. The Children's Hospital at Westmead, The University of Sydney, Sydney Medical School, Sydney, New South Wales, Australia

Professor S. Rachel Skinner. Specialty of Child and Adolescent Health, Faculty of Medicine and Health, The University of Sydney, Sydney, New South Wales, Australia

12. * Funding sources/sponsors.

Details of the individuals, organizations, groups, companies or other legal entities who have funded or sponsored the review.

None declared.

Grant number(s)
State the funder, grant or award number and the date of award

13. * Conflicts of interest.

List actual or perceived conflicts of interest (financial or academic).

None

14. Collaborators.

Give the name and affiliation of any individuals or organisations who are working on the review but who are not listed as review team members. **NOTE: email and country must be completed for each person, unless you are amending a published record.**

15. * Review question. [1 change]

State the review question(s) clearly and precisely. It may be appropriate to break very broad questions down into a series of related more specific questions. Questions may be framed or refined using PI(E)COS or similar where relevant.

What is the evidence of immunogenicity, safety, usability and acceptability of microarray patches for vaccination delivery compared to needle and syringe in people of all ages?

16. * Searches.

State the sources that will be searched (e.g. Medline). Give the search dates, and any restrictions (e.g. language or publication date). Do NOT enter the full search strategy (it may be provided as a link or attachment below.)

Using keywords, we conducted searches in CINAHL, Cochrane Library, OVID Embase, OVID MEDLINE, and Web of Science.

17. URL to search strategy. [2 changes]

Upload a file with your search strategy, or an example of a search strategy for a specific database, (including the keywords) in pdf or word format. In doing so you are consenting to the file being made publicly accessible.

Or provide a URL or link to the strategy. Do NOT provide links to your search results.

https://www.crd.york.ac.uk/PROSPEROFILES/323026_STRATEGY_20220901.pdf

Yes I give permission for this file to be made publicly available

18. * Condition or domain being studied.

Give a short description of the disease, condition or healthcare domain being studied in your systematic review.

Vaccine delivery systems.

19. * Participants/population.

Specify the participants or populations being studied in the review. The preferred format includes details of both inclusion and exclusion criteria.

All populations across the lifespan.

20. * Intervention(s), exposure(s).

Give full and clear descriptions or definitions of the interventions or the exposures to be reviewed. The preferred format includes details of both inclusion and exclusion criteria.

The interventions included in this systematic review include microarray patch (MAP) vaccine delivery systems. MAP includes delivery methods that penetrate the stratum corneum and deliver a vaccine (or placebo vaccine) to the skin rich in immune cells.

21. * Comparator(s)/control.

Where relevant, give details of the alternatives against which the intervention/exposure will be compared (e.g. another intervention or a non-exposed control group). The preferred format includes details of both inclusion and exclusion criteria.

There is no requirement for a comparator.

22. * Types of study to be included. [1 change]

Give details of the study designs (e.g. RCT) that are eligible for inclusion in the review. The preferred format includes both inclusion and exclusion criteria. If there are no restrictions on the types of study, this should be stated.

Included studies must meet the research questions and be (1) available in full-text or abstract in any language, (2) peer-reviewed, (3) empirical works (i.e., clinical studies, cohort studies, cross-sectional studies, or qualitative studies), or grey literature (i.e., conference abstracts, unpublished data, or guidelines), and conducted (4) in humans.

23. Context.

Give summary details of the setting or other relevant characteristics, which help define the inclusion or exclusion criteria.

All included studies must include MAP vaccines in their findings.

24. * Main outcome(s). [2 changes]

Give the pre-specified main (most important) outcomes of the review, including details of how the outcome is defined and measured and when these measurement are made, if these are part of the review inclusion criteria.

This review will explore differences in immunogenicity, safety, usability, and acceptability of MAP.

Measures of effect
Where applicable the differences of the main outcome will be measured using relative risk, odds ratios or risk difference. With qualitative data notable differences between MAP and N&S will be documented.

25. * Additional outcome(s).

List the pre-specified additional outcomes of the review, with a similar level of detail to that required for main outcomes. Where there are no additional outcomes please state 'None' or 'Not applicable' as appropriate to the review

Not applicable.

Measures of effect

26. * Data extraction (selection and coding).

Describe how studies will be selected for inclusion. State what data will be extracted or obtained. State how this will be done and recorded.

- Two investigators (Matthew N. Berger and Claire Thomas) will independently screen title and abstract for possible inclusion
- Two investigators will independently review full text version of articles selected in the screening stage - inclusion and exclusion criteria will be applied
- Discrepancies or disagreements at the full text stage will be resolved through discussion or when necessary, the involvement of an additional investigator
- Data from included studies will be extracted by two investigators
- Included studies will be summarised in tables
- Data will be kept by the team on a password protected drive and will be contactable

27. * Risk of bias (quality) assessment.

State which characteristics of the studies will be assessed and/or any formal risk of bias/quality assessment tools that will be used.

Quality assessments will be conducted on all studies that meet the inclusion criteria. The NIH Study Quality Assessment Tools (SQAT) will be used for quantitative studies and the Critical Appraisal Skills Programme (CASP) for qualitative studies. Quality assessment will also be conducted by two investigators.

28. * Strategy for data synthesis. [1 change]

Describe the methods you plan to use to synthesise data. This must not be generic text but should be specific to your review and describe how the proposed approach will be applied to your data.
If meta-analysis is planned, describe the models to be used, methods to explore statistical heterogeneity, and software package to be used.

To guide this systematic review the Preferred Reporting Items for Systematic Reviews and Meta-Analyses will be used. All database records of literature will be extracted to Covidence where papers will be screened by title and abstract. Studies that meet the inclusion criteria following full-text screening will be included for quality assessment using SQAT and/or CASP. Thematic synthesis will be conducted for qualitative data and summarised as overarching themes following the stages as recommended by Thomas and Harden (1). Quantitative data will be synthesised where possible as a meta-analysis using Forest Plots. Where a meta-analysis is not possible due to a lack of a standardised scale data will be synthesised using tables and grouping of similar data using the 9-point checklist by Campbell and colleagues (2).

29. * Analysis of subgroups or subsets.

State any planned investigation of 'subgroups'. Be clear and specific about which type of study or participant will be included in each group or covariate investigated. State the planned analytic approach.

Subgroups will likely be divided by age groups where appropriate (i.e., children, adults and older adults).

30. * Type and method of review.

Select the type of review, review method and health area from the lists below.

Type of review

Cost effectiveness	No
Diagnostic	No
Epidemiologic	No
Individual patient data (IPD) meta-analysis	No
Intervention	Yes
Living systematic review	No

Meta-analysis	No
Methodology	No
Narrative synthesis	No
Network meta-analysis	No
Pre-clinical	No
Prevention	No
Prognostic	No
Prospective meta-analysis (PMA)	No
Review of reviews	No
Service delivery	No
Synthesis of qualitative studies	No
Systematic review	Yes
Other	No

Health area of the review

Alcohol/substance misuse/abuse	No
Blood and immune system	No
Cancer	No
Cardiovascular	No
Care of the elderly	No
Child health	No
Complementary therapies	No
COVID-19	No
Crime and justice	No
Dental	No
Digestive system	No
Ear, nose and throat	No
Education	No
Endocrine and metabolic disorders	No
Eye disorders	No

General interest	No
Genetics	No
Health inequalities/health equity	No
Infections and infestations	Yes
International development	No
Mental health and behavioural conditions	No
Musculoskeletal	No
Neurological	No
Nursing	No
Obstetrics and gynaecology	No
Oral health	No
Palliative care	No
Perioperative care	No
Physiotherapy	No
Pregnancy and childbirth	No
Public health (including social determinants of health)	Yes
Rehabilitation	No
Respiratory disorders	No
Service delivery	No
Skin disorders	No
Social care	No
Surgery	No
Tropical Medicine	No
Urological	No
Wounds, injuries and accidents	No
Violence and abuse	No

31. Language.

Select each language individually to add it to the list below, use the bin icon to remove any added in error.

English

There is not an English language summary

32. * Country.

Select the country in which the review is being carried out. For multi-national collaborations select all the countries involved.

Australia

33. Other registration details.

Name any other organisation where the systematic review title or protocol is registered (e.g. Campbell, or The Joanna Briggs Institute) together with any unique identification number assigned by them.
If extracted data will be stored and made available through a repository such as the Systematic Review Data Repository (SRDR), details and a link should be included here. If none, leave blank.

34. Reference and/or URL for published protocol.

If the protocol for this review is published provide details (authors, title and journal details, preferably in Vancouver format)

No I do not make this file publicly available until the review is complete

35. Dissemination plans.

Do you intend to publish the review on completion?

No

36. Keywords. [1 change]

Give words or phrases that best describe the review. Separate keywords with a semicolon or new line. Keywords help PROSPERO users find your review (keywords do not appear in the public record but are included in searches). Be as specific and precise as possible. Avoid acronyms and abbreviations unless these are in wide use.

Vaccination Patch; Microarray Patch; High-Density Microarray Patch (HD-MAP); Acceptability; Usability; Safety; Immunogenicity

37. Details of any existing review of the same topic by the same authors.

If you are registering an update of an existing review give details of the earlier versions and include a full bibliographic reference, if available.

38. * Current review status. [2 changes]

Update review status when the review is completed and when it is published.
New registrations must be ongoing so this field is not editable for initial submission.

Review_Completed_not_published

39. Any additional information. [1 change]

Provide any other information relevant to the registration of this review.

Changes were made by the authors to include literature in any language and include both empirical works and grey literature prior to conducting searches (item 22). Item 28 was expanded to include how the authors plan to conduct synthesis of quantitative and qualitative data.

References

1. Thomas J, & Harden, A. Methods for the thematic synthesis of qualitative research in systematic reviews. BMC Medical Research Methodology 2008; 8(1):45-54. doi.org/10.1186/1471-2288-8-45
2. Campbell M, McKenzie J E, Sowden A, Katikireddi S V, Brennan S E, Ellis S et al. Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline BMJ 2020; 368:l6890. doi:10.1136/bmj.l6890

40. Details of final report/publication(s) or preprints if available.

Leave empty until publication details are available OR you have a link to a preprint (NOTE: this field is not editable for initial submission).
List authors, title and journal details preferably in Vancouver format.

List of Updated Fields

Systematic review

*Fields that have an **asterisk (*)** next to them means that they **must be answered. Word limits** are provided for each section. You will be unable to submit the form if the word limits are exceeded for any section. Registrant means the person filling out the form.*

3. * Anticipated or actual start date.

Give the date the systematic review started or is expected to start.

4. * Anticipated completion date.

Give the date by which the review is expected to be completed.

5. * Stage of review at time of this submission.

This field uses answers to initial screening questions. It cannot be edited until after registration. Tick the boxes to show which review tasks have been started and which have been completed. Update this field each time any amendments are made to a published record.

The review has not yet started:

Review stage:	Started	Completed
Preliminary searches		
Piloting of the study selection process		
Formal screening of search results against eligibility criteria		
Data extraction		
Risk of bias (quality) assessment		
Data analysis		

Provide any other relevant information about the stage of the review here.

11. * Review team members and their organisational affiliations.

Give the personal details and the organisational affiliations of each member of the review team. Affiliation refers to groups or organisations to which review team members belong.

14. Collaborators.

Give the name and affiliation of any individuals or organisations who are working on the review but who are not listed as review team members. NOTE: email and country are now mandatory fields for each person. Example: Dr Eric Porter, Oncologist, University Hospital, Brighton, UK. Clinical advisor

NOTE: email and country now MUST be entered for each person, unless you are amending a published record.

34. Reference and/or URL for published protocol.

If the protocol for this review is published provide details (authors, title and journal details, preferably in Vancouver format)

37. Details of any existing review of the same topic by the same authors.

If you are registering an update of an existing review give details of the earlier versions and include a full bibliographic reference, if available.

38. * Current review status.

Update review status when the review is completed and when it is published.
New registrations must be ongoing so this field is not editable for initial submission.

40. Details of final report/publication(s) or preprints if available.

Leave empty until publication details are available OR you have a link to a preprint (NOTE: this field is not editable for initial submission).
List authors, title and journal details preferably in Vancouver format.

Appendix S3: Search strategies for databases

CINAHL

"Vaccin*" or (MH "Immunization+") or “immunisation”

AND

"microneedle" or "microneedling device" or "patch vaccine" or "microarray patch"

AND

"Accepta*" OR "usability” OR “user experience" OR (MH "Usability Study") OR "usability testing" OR (MH "Safety+") OR "performance" OR (MH "Attitude+") OR "belief*" OR "preferenc*" OR "efficac*" OR (MH "Immunogenicity, Vaccine") OR "tolerability" OR "effectiv*" OR (MH "Immunity+")

Cochrane Library

(vaccin*) OR (immuni#ation)

AND

(microneedle) OR (microneedling device) OR (patch vaccine) OR (microarray patch)

AND

(Accepta*) OR (usability) OR (usability testing) OR (user experience) OR (safety) OR (performance) OR (attud*) OR (belief*) OR (preferenc*) OR (efficac*) OR (immunogenicity) OR (tolerability) OR (effectiv*) OR (immunity)

Ovid Embase

vaccin*.mp. or exp immunisation/ or immunisation.mp.

AND

microneedle/ or microneedling device/ or patch vaccine.mp. or microarray patch.mp.

AND

accepta*.mp. or usability/ or usability testing/ or user experience.mp. or exp safety/ or exp performance/ or exp attitude/ or belief*.mp. or preferenc*.mp. or efficac*.mp. or exp immunogenicity/ or tolerability.mp. or effectiv*.mp. or exp immunity/

Ovid MEDLINE

vaccin*.mp. or exp immunisation/ or immunisation.mp.

AND

microneedle/ or microneedling device/ or patch vaccine.mp. or microarray patch.mp.

AND

accepta*.mp. or usability/ or usability testing/ or user experience.mp. or exp safety/ or exp performance/ or exp attitude/ or belief*.mp. or preferenc*.mp. or efficac*.mp. or exp immunogenicity/ or tolerability.mp. or effectiv*.mp. or exp immunity/

Web of Science

vaccin* OR immunisation OR immunization

AND

microneedle OR "microneedling device" OR "patch vaccine" OR "microarray patch"

AND

accepta* OR usability OR "usability testing" OR "user experience" OR safety OR performance OR attud* OR belief* OR preferenc* OR efficac* OR immunogenicity OR tolerability OR effectiv* OR immunity

Appendix S4: Risk of bias assessment

Study	**Quality Assessment Tool Criterion**													
NIH Controlled Intervention Studies														
	1 Randomised	**2** Adequate Randomisation	**3** Treatment allocation concealed	**4** Participant and provider blinding	**5** Investigator blinding	**6** Similar group demographics	**7** ≤20% drop-out rate	**8** ≤15% differential drop-out rate	**9** Intervention adherence	**10** Similar interventions avoided	**11** Valid and reliable measures	**12** Sufficient sample size	**13** Analysis predetermined	**14** Analysed in assigned group
Depelsenaire et al., 2021	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**No**	Yes	Yes
Fernando et al., 2018	Yes	Yes	Yes	**No**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Forster et al., 2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**No**	Yes	Yes
Frew et al., 2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hirobe et al., 2015	Yes	**NR**	**NR**	**NR**	**NR**	**NR**	Yes	Yes	Yes	**CD**	Yes	**No**	Yes	Yes
Iwata et al., 2022	Yes	Yes	Yes	**No**	**No**	Yes	Yes	Yes	Yes	Yes	Yes	**No**	Yes	Yes
Rouphael et al., 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rouphael et al., 2021	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NIH Observational Cohort and Cross-Sectional Studies														
	1 Clear objective	**2** Sample specified	**3** ≥50% participation of those eligible	**4** Sample recruited from similar populations	**5** Sample size justified	**6** Exposure measured before outcome	**7** Sufficient timeframe	**8** Exposure levels related to outcomes	**9** Exposure measures valid and reliable	**10** Exposure assessed more than once	**11** Outcome measures valid and reliable	**12** Outcome assessors blinded	**13** ≤20% lost to follow-up	**14** Confounding assessed
Arya et al., 2017	Yes	Yes	**CD**	**CD**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	**No**
Birchall et al., 2011	Yes	Yes	**CD**	Yes	**No**	Yes	Yes	Yes	Yes	NA	Yes	**No**	**CD**	NA

Davies et al., 2022	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	**No**
Donnelly et al., 2014	Yes	Yes	**CD**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	**No**
Griffin et al., 2017	Yes	Yes	**CD**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**NR**	Yes	**No**
Guillermet et al., 2019	Yes	Yes	**CD**	Yes	**No**	Yes	Yes	Yes	Yes	Yes	Yes	**No**	Yes	**NR**
Hirobe et al., 2013	Yes	**No**	**CD**	**CD**	**No**	Yes	Yes	Yes	Yes	**No**	Yes	NA	Yes	**No**
Iredahl et al., 2022	Yes	**CD**	**CD**	**CD**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	**CD**	**No**
Jacoby et al., 2015	Yes	Yes	**No**	Yes	**No**	NA	**CD**	NA	NA	**No**	NA	NA	Yes	**No**
Li et al., 2022	Yes	**No**	**NR**	**NR**	**NR**	Yes	**CD**	**CD**	**CD**	**CD**	**CD**	**No**	**NR**	**No**
Muller et al., 2020	Yes	**No**	**CD**	Yes	**No**	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	**No**
Norman et al., 2014	Yes	Yes	CD	Yes	Yes	Yes	Yes	Yes	Yes	**No**	Yes	**No**	Yes	**No**

CASP Qualitative Checklist

	1 Clear objective	**2** Appropriate methodology	**3** Appropriate research design	**4** Appropriate recruitment	**5** Appropriate data collection	**6** Researcher-participant relationship	**7** Ethics considered	**8** Sufficient data analysis	**9** Clear statement of findings	**10** Is the research valuable?
Berger et al., 2022	Yes	Yes	Yes	Yes	Yes	**CD**	Yes	Yes	Yes	Yes
Birchall et al., 2011	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Davies et al., 2022	Yes	Yes	Yes	Yes	Yes	**CD**	Yes	Yes	Yes	Yes
Griffin et al., 2017	Yes	Yes	Yes	**CD**	Yes	**CD**	Yes	**No**	Yes	Yes
Guillermet et al., 2019	Yes	Yes	Yes	Yes	Yes	**CD**	Yes	Yes	Yes	Yes
Jacoby et al., 2015	Yes	Yes	Yes	Yes	Yes	**CD**	Yes	**No**	Yes	Yes
Marshall et al., 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Abbreviations: NIH, National Institutes of Health; CASP, Critical Appraisal Skills Programme.

Appendix S5: Summary of quantitative study methods and results assessing the safety of MAPs

Author, Year	Intervention and Sample Size (n)	Comparison and Sample Size (n)	Methods	Safety, Adverse Events, and Pain Findings
Arya et al., 2017	• Coated MAP with placebo (n=15)	N/A	• Skin scoring scale to measure tolerability • Skin staining and microscopy • Surveys	Erythema was reported in all participants on day 0, 80% (n=12) on day 1, 13% (n=2) on day 4, and resolved on day 7. On day 0, 87% (n=13) were mild erythema (grade 2) and 13% (n=2) were very slight erythema (grade 1). No swelling was apparent. Pain scores of 0 were reported during administration by 93% (n=14) of participants. One participant (7%) reported a pain score of 1/10.
Berger et al., 2022	• Excipient-coated MAP (n=44)	N/A	• Semi-structured interviews	Participants discussed concerns regarding unsupervised home self-administration of MAP vaccines due to the potential for adverse events to occur.
Birchall et al., 2011	• MAP (not administered) (n=58)	N/A	• Focus groups • Surveys	A higher proportion of HCPs (75%) compared to laypeople (57%) believed that reduced sharps injury was a key advantage of MAPs. Participants (80%) were concerned about misuse of abuse for MAPs and cross-contamination from HCPs (84%), and they believed education would be required to prevent cross-contamination (100%).
Depelsenaire et al., 2021	• Influenza A/Sing coated MAP (n=5)	• Placebo uncoated MAP (n=5)	• SII • Flow cytometry • Immunohistochemistry	AEs were reported in 90% of participants (n=9), with 100% (n=5) in the Influenza MAP vaccine group and 80% (n=4) in the placebo MAP group. There was delayed erythema from day 4, resolving by day 8. Oedema responses were short-lived.
Donnelly et al., 2014	• Self-administration of hydrogel-forming MAPs (n=20)	N/A	• Evaporimetry • Optical coherence tomography • Surveys (1=strongly positive to 5=strongly negative)	Student pharmacists considered the MAP to have a reduced risk of sharps injury (90%), bleeding (60%), and tissue damage (65%). One participant believed there could be a risk of misuse or abuse of MAPs. Participants found MAP less painful than N&S (100%), recording positive scores.
Fernando et al., 2018	• Coated HD-MAP with A/Cali (H1N1)-like antigen on forearm (n=15) • Coated HD-MAP with A/Cali (H1N1)-like antigen on deltoid site (n=15)	• Fluvax by IM injection (n=15) • Placebo MAP to forearm (n=5) • Placebo MAP to deltoid site (n=5) • Saline by IM injection (n=5)	• SII • HAI assays • MN assays • Visual analogue scale (0=no pain, 10=worst pain)	No serious AEs were observed. There were 40 AEs reported in 30 participants (50% in MAP vaccine to forearm, 60% in MAP vaccine to deltoid, 33% in IM vaccine, and 53% in placebo groups). AEs were mild to moderate in severity, with one serious AE assessed as unrelated to treatment. Mean pain scores 10 minutes after administration among participants receiving influenza vaccine were: 1.1 (95% CI: 0.51-1.61) for the MAP forearm group, 0.9 (95% CI: 0.24-1.50) for the deltoid group, and 0.8 (95% CI: -0.04-1.64) for IM group. Participants receiving placebo were: 0.8 (95% CI: -0.16-1.76) for the MAP forearm group, 0.8 (95% CI: -0.16-1.76) for the MAP deltoid group, and 0 for the IM group.
Forster et al., 2020	*Part A* • 15µg influenza MAP to forearm (n=15) *Part B* • 2.5µg influenza MAP to forearm (n=20) • 5µg influenza MAP to forearm (n=20) • 10µg influenza MAP to forearm (n=20) • 15µg influenza MAP to forearm (n=20) • 15µg influenza MAP to deltoid (n=20)	*Part A* • Uncoated MAP to forearm (n=15) • 15µg A/Sing by IM injection (n=15) • QIV by IM injection (n=15, 1 withdrawal) *Part B* • Uncoated MAP to forearm (n=20) • QIV (A/Sing) by IM injection (n=20, 1 withdrawal)	• SII • HAI assays • MN assays • ELISA • Flow cytometry	No serious AEs were observed. In Part A, 60 treatment-emergent AEs were reported in 62% of participants. Two participants experienced moderate severity AEs. In Part B, 235 AEs were observed in 111 (79%) of the participants. Six were moderate in severity, with the remainder mild. In Part A, the pain was only reported by 13% in the A/Sing IM group. In Part B, the pain was reported only among 5% of QIV IM participants.

Griffin et al., 2017	• Uncoated MAP and excipient-coated MAP (n=18)	N/A	• SII • Electron microscopy • Visual analogue scale (0=no pain, 10=worst pain) • Semi-structured interviews	No serious AEs were observed. Erythema contributed to a higher skin irritation index score than other AEs (i.e., oedema). The highest scores were reported within 2 hours of administration. Erythema faded to discolouration between days 2 and 3, which faded between days 7 and 28. Excipient-coated MAPs resulted in increased extended erythema among 55% of applications compared to 40% of uncoated MAP applications. Extending erythema was limited to 2cm around the site, with only one application extending between 2-5cm. Only one participant reported mild itching following excipient-coated MAP application, which resolved within 24 hours. Between days 7 and 14, 72% of participants reported mild exfoliation at application sites. Of the 72 applications, 56 (74%) scored a pain score of 0. Excipient-coated MAP applications (n=60), 77% (n=46) reported 0. Eight participants experienced pain at 10 minutes, with most (n=7) reporting 0 at 1 hour and no participants by 2 hours. The forearm was considered more painful, with 33% of participants reporting pain compared to 11% with deltoid administrations.
Hirobe et al., 2013	• Dissolving MAP administered to left deltoid site (n=20)	N/A	• International Contact Dermatitis Research Group classification • Microscopy • Mobile Tewameter for transepidermal water loss • Visual analogue scale (0=no pain, 100=worst pain)	Each participant received three types of MAPs (microneedle lengths of 200µm, 500µm and 800µm). Mild erythema was observed in 26 applications which were more common in 500µm and 800µm. Purpura was present in 30% of applications of 500µm and 800µm MAPs and none from the 200µm MAP. AEs resolved in most within 7 days and completely recovered within 30 days. One participant continued to have unproblematic pigmentation. Pain scores were reported as low across the MAP groups but were no numeric data was provided.
Hirobe et al., 2015	• Dissolving MAP with trivalent influenza (n=7)	• Trivalent influenza by SC injection (n=20)	• Microscopy • ELISpot assays • HAI assays • Haemagglutination assays • Sandwich ELISA • Pain scale not reported	No systemic AEs were observed in the MAP vaccine group. Erythema was present in all participants receiving MAP vaccine which peaked around day 2 and resolved by day 21. SC group has 13 (65%) participants with observed erythema. One participant who received MAP vaccine was observed with extending erythema with a 9cm diameter. Of the SC injection group, 8 (40%) participants still had noticeable injection marks at day 21. About half of the MAP vaccine participants were reported to have developed pigmentation first observed on day 7. Purpura was also observed in about half of MAP participants, resolved by day 21. More than half of the SC group developed purpura. Fever was observed in 25% (n=5) of SC participants and 0% in the first administration, 5% (n=1) of the SC group and 14% (n=1) in the second administration. Proportions of participants who experienced pressure-induced pain were reported over 2 administration points. 1st administration: MAP=1 (14%), SC=5 (25%). 2nd administration: MAP=0 (0%), SC=1 (5%)
Iredahl et al., 2022	• Uncoated HD-MAP (n=12)	N/A	• Evaporimetry • Polarisation spectroscopy • Dermoscopy • Visual analogue scale (0=no pain, 10=worst pain)	Dry skin and exfoliation were observed in 9 of 24 cases which almost doubled at later time points. At 10 minutes after administration, no pain scores were reported above 3, and most reported pain of 0 except for two participants.
Iwata et al., 2022	• Dissolvable MAP containing JEV (high dose) (n=13) • Dissolvable MAP containing JEV and (low dose) (n=13)	• JEV by SC injection (n=13)	• Microscopy • ELISA • Neutralising antibody assays • Visual analogue scale (0=no pain, 100=worst pain)	Mean pain scores during administration were reported over two administrations at day 0 and day 21. 1st administration: 11.5 (SD=14.4) for MAP high dose group, 11.8 (SD=12.3) for MAP low dose group, and 16.9 (SD=10.3) for SC group. 2nd administration: 11.1 (SD=16.3) for MAP high dose group, 13.5 (SD=18.5) for MAP low dose group, and 16.8 (SD=14.5) for SC group.
Li et al., 2022	• Mushroom-inspired imprintable and lightly detachable (MILD) (coated) MAP (n=3)	• N&S (route not reported) (n=3)	• Skin reactions ranged from 1=no reaction to 4=very serious, otherwise not clearly defined • Pain scale not reported • Surveys	Pruritus, erythema, site heat, swelling and bleeding were reportedly lower than N&S. No numeric data was reported. MAP was reported as less painful than N&S. No numeric data was reported.
Muller et al., 2020	• Excipient-coated MAP to the forearm and deltoid (n=12)	N/A	• Tewameter • Tissue Viability Imaging • Dermoscopy	MAPs were well tolerated, with all participants experiencing very mild erythema. Other recorded AEs (oedema and petechia) were minor. Wet bleeding was observed only after the MAP removal in 10 of the 36 applications.

Norman et al., 2014	• Coated MAP self-administered or investigator-administered compared	• IM injection	• Skin staining • Visual analogue scale (0=no pain, 100=worst pain) • Surveys	All MAP applications were well tolerated, with only very mild erythema observed. Median pain scores were: 1.5 (IQR=5) for self-administration, 1.5 (IQR=8) for HCP administered, and 15 (IQR=30) for IM injection.
Rouphael et al., 2017	• Dissolving MAP with inactivated influenza vaccine self-administered (n=25) • Dissolving MAP with inactivated influenza vaccine administered by HCP (n=25)	• Inactivated influenza vaccine by IM injection (n=25) • Placebo dissolvable MAP (n=25)	• Haemagglutination inhibition assays • Food and Drug Administration toxicity grading • Surveys	No serious AEs were observed related to treatment. HCP administered and self-administered groups' AEs were similar and mild (*P*=0.2). Incidence of AEs of moderate severities was higher in the IM group (12%, 95% CI: 16-31%) compared to either MAP group (2%, 95% CI: 0-11%, *P*=·02). There was strong evidence of higher local AEs reported among MAP groups compared to IM with 82% (95% CI: 69-91%) compared to 16% (95% CI: 5-36%, *P*<.001) pruritus, and 40% (95% CI: 26-55%) compared to 0% (95% CI: 1-14%, *P*<.001). In participants receiving MAP vaccines, 48 (96%) reported a pain score of 0 (95% CI: 86-100%). IM injection was only painless among 18 (82%, 95% CI: 60-95%) participants (*P*=.04).

Abbreviations: AE, adverse event; A/Cali, A/California/07/2009 H1N1; A/Sing, A/Singapore/GP1908/2015 H1N1; CI, confidence interval; ELISA, enzyme-linked immunosorbent assay; ELISpot, enzyme-linked immune absorbent spot; HAI, haemagglutination inhibition; HCP, healthcare professional; HD-MAP, high-density microarray patch; IM, intramuscular; IQR, interquartile range; JEV, Japanese encephalitis vaccine; MAP, microarray patch; MN, microneutralisation; N&S, needle and syringe; QIV, quadrivalent influenza vaccine; SC, subcutaneous; SD, standard deviation; SII, Skin irritation index.

Appendix S6: Summary of quantitative study methods and results assessing the usability and acceptability of MAPs

Author, Year	Intervention and Sample Size (n)	Comparison and Sample Size (n)	Methods	Usability and Acceptability Findings
Arya et al., 2017	• Coated MAP with placebo (n=15)	N/A	• Skin scoring scale to measure tolerability • Skin staining and microscopy • Surveys	About half (53%) of participants felt confident that they correctly administered the MAP, and 33% felt somewhat confident. Two (14%) were not confident that they correctly administered the MAP. Almost all participants (93%) would prefer to use MAP compared to N&S. Only one (7%) preferred N&S due to the longer wear time of the MAP.
Berger et al., 2022	• Excipient-coated MAP (n=44)	N/A	• Semi-structured interviews	Participants highlighted several benefits of MAPs, including potential use for mass distribution due to enhanced thermostability and mass administration. This may also reduce burden on healthcare services and resources due to trained user administration rather than requiring a healthcare professional. Convenience was another aspect for older adults, being able to self-administration and potentially avoid appointments and associated costs. There was also a potential for increased acceptability of MAPs for vaccination thus leading to increased vaccination uptake.
Birchall et al., 2011	• MAP (not administered) (n=58)	N/A	• Focus groups • Surveys	HCPs (95%) and laypeople (100%) strongly agreed that a visual indicator to confirm the MAP delivered a dose was required. Participants (84%) believed it would be difficult to administer doses through a hollow MAP device. HCPs (90%) had strong confidence in N&S[c] for delivering a correct dose. With clear IFU, 88% of participants would feel comfortable self-administering MAPs. Most participants (84%) felt that self-administration was a considerable advantage. Regarding settings, 25% preferred MAP availability at a pharmacy for home use, 8% preferred general sale for home use. Most preferred (75% of HCP and 83% of public participants) MAPs to be provided by HCPs in a clinical setting. Participants would still prefer painful N&S if it were more effective than MAP. All believed MAPs would be beneficial to needle-phobic patients. Most (92%) also believed MAP would benefit paediatric patients and even be willing to administer MAP to a child in their care (80%).
Davies et al., 2022	• MAP administered to the deltoid and forearm (simulated)	N/A	• Observation checklist • Surveys • Semi-structured interviews	Ninety-one percent (SD=13%) of professional immunisers (PIs) found the MAP extremely easy to use. HCWs also found the MAP easy to use (93%, SD=11%) when self-administering or having it administered by HCPs. The MAP wear time was 10 seconds, of which PIs achieved 36% of the time with a mean of 8·4 seconds (SD=1·9) when self-administering and 9.2 seconds (SD=2.5) when administering to others. HCWs achieved a 10-second wear time 58% of the time with a mean of 10.2 seconds (SD=3.5) when self-administering.
Donnelly et al., 2014	• Self-administration of hydrogel-forming MAPs (n=20)	N/A	• Evaporimetry • Optical coherence tomography • Surveys (1=strongly positive to 5=strongly negative)	Most participants (80%) were not confident that they applied adequate pressure for insertion, and almost half (45%) were not confident it would have delivered a correct dose. Administering MAPs after reading IFU and having a pharmacist consultation was perceived as positive by all (80%=strongly positive, 20%=positive). All participants felt MAPs could be used in the general patient population and used for self-administration. About half (45%) were not confident that MAP could deliver a dose sufficiently compared to N&S. All believed MAP could be beneficial to needle-phobic patients. Almost all (95%) believed MAP could benefit paediatric patients. All participants felt that pharmacist consultation and IFU were required, and that demonstration would be useful. About three-quarters (70%) believed high cost could be a concern compared to N&S.
Fernando et al., 2018	• Coated HD-MAP with A/Cali (H1N1)-like antigen on forearm (n=15)	• Fluvax by IM injection (n=15) • Placebo MAP to forearm (n=5)	• SII • HAI assays • MN assays	Over half (55%) preferred MAP over their experience of N&S, with 21% of participants having no preference. A quarter of participants (24%) preferred N&S due to familiarity or to avoid the mark and itching at the site of the MAP application.

	• Coated HD-MAP with A/Cali (H1N1)-like antigen on deltoid site (n=15)	• Placebo MAP to deltoid site (n=5) • Saline by IM[i] injection (n=5)	• Visual analogue scale (0=no pain, 10=worst pain)	
Frew et al., 2020	• Dissolving MAP with inactivated influenza vaccine self-administered (n=25) • Dissolving MAP administered by HCP (n=24)	• Inactivated influenza vaccine by IM injection (n=25) • Placebo dissolvable MAP (n=25)	• Surveys using 4- and 5-point Likert scales (1=strongly disagree to 4 or 5=strongly agree)	Influenza MAPs were considered strongly by participants as easy to use on the 5-point Likert scale (mean=4.16, SD=0.78). Participants were confident they could determine the correct application (mean=3.70, SD=1). Most participants receiving a MAP believed their MAP was better than N&S, increasing over time from 55.7% on day 0, 61% on day 8, and 64.3% on day 28. The remaining MAP users believed MAP was not better, nor worse, remained relatively low over the study period (32.1-25.4%). A proportion reported that MAP was worse than N&S, varying between 0-23.8% in MAP recipients across the survey time points. Overall, on day 0 61% of participants preferred MAP over N&S increasing to 72.3% at day 8, and 69.9% at day 28. IM recipient preference for MAP decreased over time from 73.9% on day 0 to 52.2% on day 28. Positive experience with MAP ranged from 95.8-100%, whereas positive experience with IM injection was 86.4%. On a 4-point Likert scale, most participants felt that the benefits of MAP were important compared to N&S (mean=3.65, SD=1.05). Participants also felt that N&S had important drawbacks (mean=2.91, SD=1.06). A very large proportion of participants considered MAP more convenient (mean=3.99, SD=1.06) and would save time (mean=3.83, SD=1.11) compared to N&S.
Griffin et al., 2017	• Uncoated MAP and excipient-coated MAP (n=18)	N/A	• SII • Electron microscopy • Visual analogue scale (0=no pain, 10=worst pain) • Semi-structured interviews	Most participants (n=15) preferred the MAP compared to N&S for vaccine delivery. The remaining participants (n=3) preferred N&S to either avoid the mark from MAPs (n=2) or due to familiarity (n=1). The deltoid site application was preferred (n=16) for MAP than the forearm. Visibility of the MAP's mark and increased sensation on the forearm were factors influencing site preference. Participants in interviews later in the study commented that marks resolved quicker on the deltoid than the forearm. Participants also found the MAP painless and acceptable wear time of 2 minutes.
Guillermet et al., 2019	• MAP administration (simulation) (n=314)	N/A	• Surveys • Semi-structured interviews	Of the 137 eligible parents or guardians, 9 refused to participate due to the unfamiliarity of the MAP (n=7) or their children were unsettled (n=2). Over Benin, Nepal and Vietnam, MAP use in clinical settings for routine vaccination (91·8%) and outreach settings (87·7%) use was well accepted. MAP use at home during outreach was viewed more cautiously (60·2%). Community representatives were most accepting (79%) of MAP administration by community health volunteers (HCVs) but less so by HCWs (50%) and CHVs (45%). Parents and guardians (37%) were not confident in CHV skills, knowledge and familiarity with MAP to vaccinate their children preferring experienced HCPs. Overall parents and guardians were highly accepting of MAPs being administered to their children in clinical settings (92·7%) with the lowest acceptance in Nepal (81·3%), and highest in Vietnam (98·3%).
Jacoby et al., 2015	• Dissolving and coated MAP for influenza vaccine delivery (not administered)	N/A	• Interviews • Scale (1=strongly positive, 4=neutral, 7=strongly negative)	Expert participants rated 4 administration methods. HCP administration (100%) and HCP supervised group administration (90%) were the most preferred. Approval dropped for self-administration via prescription (79%) and over the counter for self-administration (45%).
Norman et al., 2014	• Coated MAP self-administered or investigator-administered compared	• IM injection	• Skin staining • Visual analogue scale (0=no pain, 100=worst pain) • Surveys	MAPs were tested with a snap-based (SB) and without a snap-based (WSB) device. The median successful insertions on the first administration were 90% with a wide variability (IQR=44%). The second and third administrations improved to 94% (IQR=13-15%, *P*=.003, Friendman's rank test). SB MAPs saw a median of 96% (IQR=5%) on the first administration with subsequent administrations being similar (93-95%, IQR=9-10%). The improvement between WSB and SB was significant (*P*=.006, Mann-Whitney U). Intention to be vaccinated when offered MAP increased to 61% (95% CI: 50-70%). Fifty-one percent of normally vaccinated participants expressed preference for MAP, the remainder preferred IM (49%). Normally unvaccinated participants expressed willingness to be vaccinated after being offered MAP at 30% (95% CI: 19-44%). The option to self-administer MAP increased intent from 44% to 65%. Thirty-eight percent (95% CI: 26-52% of normally unvaccinated participants

				expressed willingness be vaccinated. Those willing to be vaccinated by any method, 55% preferred to self-administer MAP at home, 9% preferred HCP supervised self-administration, 12% preferred HCP administration, and 24% preferred IM injection. Overall, there was a 76% preference for MAP over IM, and a 64% preference for self-administration over HCP administration. Predictors of MAP uptake were highly significant in reliability and usability (*P*=.001), but less significant in normative approval (*P*=.02) and positive attitude towards MAPs (*P*=.046).
Rouphael et al., 2017	• Dissolving MAP with inactivated influenza vaccine self-administered (n=25) • Dissolving MAP with inactivated influenza vaccine administered by HCP (n=25)	• Inactivated influenza vaccine by IM injection (n=25) • Placebo dissolvable MAP (n=25)	• Haemagglutination inhibition assays • Food and Drug Administration toxicity grading • Surveys	On day 28, participants (70%, 95% CI: 55-83%) preferred MAP compared to IM injection for future vaccination (*P*<·001). Five participants reported no preference between MAP, IM or nasal delivery.

Abbreviations: AE, adverse event; A/Cali, A/California/07/2009 H1N1; CI, confidence interval; CHV, community health volunteers; ELISA: enzyme-linked immunosorbent assay; ELISpot, enzyme-linked immune absorbent spot; HAI, haemagglutination inhibition; HCP, healthcare professional; HCW, healthcare worker; HD-MAP, high-density microarray patch; IM, intramuscular; IQR, interquartile range; MAP, microarray patch; MN, microneutralisation; N&S, needle and syringe; SC, subcutaneous; SD, standard deviation; SII, Skin irritation index.