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ORIGINAL RESEARCH

Knowledge and attitudes of Australian dermatologists towards sentinel lymph node biopsy for melanoma: a mixed methods study

Andrea L Smith[1,2] | Caroline G Watts[2,3] | Samuel Robinson[2] | Helen Schmid[4] | Chris Goumas[2] | Victoria J Mar[5] | John F Thompson[6,7,8,9] | Frances Rapport[1] | Australian Melanoma Centre of Research Excellence Study Group[†] | Anne E Cust[2,6]

[1]Australian Institute of Health Innovation, Macquarie University, Sydney, NSW, [2]Cancer Epidemiology and Prevention Research, Sydney School of Public Health, The University of Sydney, Sydney, NSW, [3]Surveillance, Epidemiology and Prevention Program, Kirby Institute, University of New South Wales, Sydney, NSW, [4]Centre for Cancer Research, Westmead Institute for Medical Research, Sydney, NSW, [5]Victorian Melanoma Service, The Alfred Hospital, Melbourne, VIC, [6]Melanoma Institute Australia, The University of Sydney, Sydney, NSW, [7]The Faculty of Medicine and Health, The University of Sydney, Sydney, NSW, [8]Royal Prince Alfred Hospital, Sydney, NSW, and [9]Mater Hospital, Sydney, NSW, Australia

Correspondence: Dr Andrea Smith, Australian Institute of Health Innovation, 75 Talavera Road, Macquarie University, NSW 2109, Sydney, Australia. E-mail: andrea.smith@mq.edu.au

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[†]Australian Melanoma Centre of Research Excellence Study Group members present in appendix 1.

Andrea L Smith, PhD. Caroline G Watts, PhD. Samuel Robinson, BPH. Helen Schmid, MPH. Chris Goumas, MPH. Victoria J Mar, PhD. John F Thompson, MD. Frances Rapport, PhD. Anne E Cust, PhD.

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ABSTRACT

Background/Objectives: In melanoma management, sentinel lymph node biopsy (SLNB) is used to stage patients and to indicate prognosis. More recently, it has been used to select patients for adjuvant therapy. This study aimed to report knowledge of and attitudes towards SLNB for patients with melanoma among Australian dermatologists.

Methods: Mixed methods study using cross-sectional questionnaires (n = 88) and semi-structured interviews (n = 13), May–September 2019.

Results: Of the dermatologists surveyed, 56% thought SLNB had an important role in melanoma management, 26% were unsure and 18% thought SLNB unimportant. Of the 92% who would discuss SLNB with their patients, the main stated value of SLNB was for assessing eligibility for adjuvant therapies (79%); only 60% indicated SLNB was of value for providing prognostic information, and just over half (53%) thought it could improve staging. Interview data indicated that attitudes towards SLNB are shifting among dermatologists, driven by data from landmark clinical trials and the influence of professional networks. Accordingly, interviewees adopted one of three positions in relation to SLNB: (a) believed in utility of SLNB and adhered to the guidelines; (b) were unconvinced about utility of SLNB but adhered to the guidelines; and (c) were unconvinced about utility of SLNB and did not adhere to the guidelines.

Conclusion: Although most of the dermatologists surveyed were familiar with and follow the SLNB recommendations, some disagreement with and

distrust of the recommendations was evident. Greater acceptance of the SLNB recommendations appeared to be driven by the improved outcomes demonstrated in stage III patients receiving adjuvant systemic therapy.

Key words: clinical practice guidelines, dermatology, diagnosis, management, melanoma, metastasis, sentinel lymph node biopsy, staging.

INTRODUCTION

Every year, more than 15 000 people are diagnosed with melanoma in Australia.[1] Although most of these patients are cured by surgical excision, some develop metastasis and die of melanoma.[2] Several recent landmark clinical trials have resulted in significant changes to how patients identified as having higher-risk melanomas are managed,[3–8] with an increasing emphasis on treatment with adjuvant systemic therapies.[9] In Australia, access to these therapies for clinically node-negative patients currently requires a patient's melanoma to be staged using sentinel lymph node biopsy (SLNB) and micro-metastases to be detected in the nodes. The current Australian melanoma management guidelines state that SLNB should be considered for all patients with melanoma >1 mm in thickness and for patients with melanoma ≥0.8 mm with other high-risk pathological features.[10] The main benefits of having a SLNB include improved prognostic information and improved staging which enables treatment to be better matched to the patient's stage of disease.[10]

In Australia, most melanomas are initially managed by either a general practitioner (53%) or a dermatologist (26%),[11] neither of whom perform SLNB. Some clinicians have been cautious about or have disagreed with claims made about the role of SLNB in melanoma management. In particular, there has been disagreement over the claimed survival benefit and the prognostic benefit of SLNB over and above other readily available clinicopathological criteria of the primary melanoma.[12–15] Rates of SLNB in Australia and internationally have been reported to be between 33% and 53%.[16–20] A recent study reported the views of Australian general practitioners towards SLNB,[21] but there are limited data on Australian dermatologists' knowledge of and attitudes towards SLNB in the management of melanoma. This study aimed to: (i) report the knowledge and attitudes of dermatologists towards SLNB for patients with invasive melanoma and how this might relate to decisions about referral for SLNB; and (ii) to explore factors that influence their knowledge and attitudes.

MATERIALS AND METHODS

Recruitment

Qualified Australian dermatologists were recruited at the Australasian College of Dermatologists' Annual Scientific Meeting in Melbourne, Victoria, in May 2019 and the Rural Dermatology Meeting in Orange, NSW, in September 2019. Participants who completed the questionnaire were asked if they would be interested in being interviewed and were offered AUD$100 reimbursement for their time.

Data collection

A questionnaire and semi-structured interview guide (Supplementary file S1) were developed from a literature review and discussion with a multidisciplinary team of clinicians and researchers. Questionnaire data were managed using REDCap. Telephone and face-to-face interviews were conducted, audio-recorded, de-identified and professionally transcribed.

Data analysis

The questionnaire and interview data sets were analysed separately then integrated (Supplementary file S2).[22] For the questionnaire data, factors associated with familiarity with Australian melanoma clinical practice guidelines and knowledge of and attitudes towards SLNB were examined, including: age; gender; type of practice; social disadvantage (calculated using Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD) based on location of practice[23]); years in practice; number of invasive melanomas diagnosed per year; and exposure to articles or presentations about SLNB. *P*-values for comparing proportions between subgroups were calculated using chi-square tests. Prevalence ratios were calculated from cross-tabulations, and likelihood confidence intervals (CIs) calculated using the FREQ procedure in SAS (version 9.4).[24]

Interview data were analysed using thematic analysis.[25,26] Two researchers (SR and ALS) read the transcripts. Coding and theme development were performed using NVivo 12 software. A thematic map was developed which was discussed with the research team. Themes were mapped to the Flottorp determinants of practice framework, which provided a systematic means of understanding factors that could potentially influence dermatologists' adherence to the Australian guidelines' SLNB recommendations.[27] Findings were reported according to the COREQ and the STROBE guidelines.[28,29]

RESULTS

The questionnaire was completed by 88 dermatologists, of whom 13 (15%) consented to be interviewed (Table 1).

Questionnaire results

Familiarity with Australian clinical practice guidelines for the diagnosis and management of melanoma

Self-reported familiarity with the guidelines for melanoma management varied, with 75% quite or very familiar, 11%

Table 1 Characteristics of dermatologists who completed the questionnaire and who were interviewed

Characteristic	Questionnaire $n = 88$ (%)	Interview $n = 13$ (%)
Gender		
Male	49 (56)	3 (23)
Female	39 (44)	10 (77)
Age		
<30 years	5 (6)	0 (0)
30–49 years	31 (35)	8 (62)
50–69 years	47 (53)	4 (31)
70 + years	5 (6)	1 (8)
Practice type[†]		
Independent specialist practice	32 (36)	4 (31)
Dermatology group specialist practice	45 (51)	4 (31)
Melanoma unit	6 (7)	4 (31)
Other	5 (6)[‡]	1 (8)[‡]
Number of years practising as a dermatologist		
<5 years	17 (19)	5 (38)
6–10 years	11 (13)	3 (23)
11–20 years	22 (25)	1 (8)
21–30 years	22 (25)	3 (23)
>30 years	16 (18)	1 (8)
Number of patients seen with invasive melanoma per year[§]		
1 patient	2 (2)	2 (15)
2–5 patients	11 (13)	4 (31)
6–10 patients	22 (25)	4 (31)
11–30 patients	29 (33)	3 (23)
>30 patients	23 (26)	0 (0)
Missing	1	0
Location of practice[¶]		
Major city	76 (88)	11 (80)
Inner regional	6 (7)	1 (10)
Outer regional	4 (5)	1 (10)
Remote and very remote	0 (0)	0 (0)
Missing	2	0
Practice by socio-economic index**		
Q1 (most disadvantaged)	3 (3)	0 (0)
Q2	11 (13)	1 (10)
Q3	12 (14)	0 (0)
Q4 (least disadvantaged)	60 (70)	12 (90)
Missing	2	0

[†]Practice type: dermatologist may have had more than one place of practice but were asked to choose the one that 'best described the type of practice they worked in'.

[‡]Other: hospital based.

[§]Not including melanoma *in situ*/lentigo melanoma.

[¶]Postcodes were classified using the Australian Statistical Geography Standard (ASGS) remoteness structure.[38]

**Postcodes were classified using the Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD).[25]

a little familiar and 14% very unfamiliar or somewhat unfamiliar. The only factor significantly related to familiarity with the guidelines was exposure to articles or presentations about SLNB in the past 3 years (prevalence ratio 2.77, 95% CI 1.20–14.60).

Discussing and recommending SLNB and other tests

Most dermatologists (92%) reported that they would usually discuss SLNB and recommend it for a patient with a newly diagnosed melanoma if eligible for SLNB. However, only 56% thought SLNB had an important role in management, 26% were unsure and 18% thought SLNB did not have a role. Younger dermatologists were more likely to report that SLNB had an important role in the management of melanoma patients (69% for those aged <50 years; 46% for ≥50 years, $P = 0.03$). However, gender, socio-economic disadvantage (based on practice location), practice type, number of melanoma patients seen per year and years in practice were not related to their views on the importance of SLNB.

Of the 92% of dermatologists who reported that they had read articles or listened to presentations about SLNB in the past 3 years, one-third (34%) indicated that these articles or presentations had made them more likely to recommend SLNB; for many, an important factor was hearing or reading that SLNB could play a role in identifying patients eligible for adjuvant systemic therapy. For the 41% who reported that these articles or presentations had made them less likely to recommend SLNB, the factor most often reported was hearing or reading that SLNB provided no confirmed survival benefit.

Knowledge of guidelines relating to SLNB and management of patients

Among the 80 dermatologists (92%) who reported discussing SLNB and recommending it to their patients, the factors most likely to influence their decision to discuss and recommend were Breslow thickness (91%), ulceration (76%) and mitotic rate (66%) (Table 2). However, only 66% correctly identified that SLNB should be considered for melanomas with a Breslow >1.01–2.00 mm or 0.80–1.00 mm with high-risk pathological feature(s); only 61% correctly identified that a SLNB should be considered for melanoma 2.01–4.00 mm; and only 44% correctly identified that a SLNB should be considered for melanomas with a Breslow >4.00 mm. SLNB was identified to be of value to assess suitability for adjuvant systemic therapy by 79% of dermatologists; however, fewer dermatologists indicated a role for SLNB in providing prognostic information (60%) or in providing more accurate staging information (53%) (Table 2).

Interview results

An overarching theme (the tension between best practice as outlined in clinical practice guidelines and the extent to which participants believed adherence would lead to desired outcomes) and three sub-themes were identified: concerns about utility of SLNB; the changing melanoma management landscape; and the influence of professional networks (Figures 1 and 2; Table 3; Supplementary file S3). The tension between best practice and expected outcomes was most evident in the differing positions adopted in relation to SLNB. These positions were: (i) believing in the utility of SLNB and adhering to the recommendations ($n = 7$); (ii) being unconvinced about the utility of SLNB but adhering to the recommendations ($n = 4$); and (iii)

Table 2 Dermatologists' knowledge of guidelines relating to sentinel lymph node biopsy and management of patients with invasive melanoma (n = 80)[†]

Question	n (%)
At what Breslow thickness would you advise a patient that SLNB would be appropriate and refer them onto a surgeon for management?[‡]	
<0.80 mm	1 (1)
<0.80 mm with high-risk pathological feature(s)	12 (15)
0.80–1.00 mm	18 (23)
0.80–1.00 mm with high-risk pathological feature(s)	53 (66)
1.01–2.00 mm	53 (66)
2.01–4.00 mm	49 (61)
>4.00 mm	35 (44)
None of the above (I would not refer for SLNB)	4 (5)
Would any of these factors influence your decision to discuss or recommend SLNB?[‡]	
Breslow thickness	73 (91)
Presence of ulceration	61 (76)
Mitotic rate	53 (66)
Lymphovascular invasion	50 (63)
Age of the patient	49 (61)
Presence of palpable regional lymph nodes	44 (55)
Comorbidities of the patient	42 (53)
The likelihood that the results will influence patient management	39 (49)
Patient preference	41 (51)
Possible morbidity of the SLNB procedure	35 (44)
Histopathological subtype	27 (34)
Patient level of anxiety	28 (35)
Body site of the melanoma	23 (29)
Wide excision already performed	23 (29)
Access to services for SLN mapping and biopsy	22 (28)
Possible morbidity of completion lymphadenectomy	19 (24)
Distance to services for SLN mapping and biopsy	19 (24)
Costs to the patient	14 (18)
Type of wound closure following diagnostic biopsy	6 (8)
Other	3 (4)
Reasons why SLNB may be of value for eligible patients[‡,§]	
To assess suitability for adjuvant systemic therapies (if SLNB positive)	63 (79)
To provide prognostic information	48 (60)
More accurate staging	42 (53)
Results may influence follow-up plan	32 (40)
To select patients for completion lymphadenectomy	17 (21)
Improved regional control	8 (10)
Likely survival benefit	2 (3)
Other	6 (8)
For patients for whom SLNB would be suitable, who would you usually refer the patient to for definitive management?[‡]	
A specialist melanoma service where there is a multidisciplinary team	33 (41)
A melanoma-trained surgical oncologist	22 (28)
A melanoma-trained plastic surgeon	18 (23)
A local general surgeon	6 (8)
Any plastic surgeon	4 (5)
A melanoma specialist dermatologist	2 (3)
None of the above (I would not refer for SLNB)	2 (3)
Any surgical oncologist	1 (1)
Would you expect the clinician to whom you refer the patient to recommend SLNB?	
Never	0 (0)
Occasionally	8 (10)
Most of the time	63 (79)
Always	8 (10)
I would not refer to a surgeon who routinely recommends SLNB	1 (1)
Are there any tests of scans that you would arrange for patients eligible for SLNB?[‡]	
No other tests or scans	47 (59)
Whole-body PET–CT	14 (18)
Ultrasound examination of regional nodes	12 (15)
CT chest/abdomen/pelvis	8 (10)
CT or MRI of brain	6 (8)
Chest X-ray	3 (4)
Other[¶]	10 (13)
After a positive SLNB for melanoma, do you wish to be involved in ongoing patient follow-up?	
No	1 (1)
Yes, follow-up managed mainly by myself	7 (9)
Yes, follow-up managed mainly by the surgeon	12 (15)
Yes, with follow-up managed in a shared-care arrangement between the surgeon and myself	58 (74)
Missing	2
After a negative SLNB for melanoma, do you wish to be involved in ongoing patient follow-up?	
No	1 (1)
Yes, follow-up managed mainly by myself	44 (56)
Yes, follow-up managed mainly by the surgeon	0 (0)
Yes, with follow-up managed in a shared-care arrangement between the surgeon and myself	33 (42)
Missing	2

CT, computed tomography; MRI, magnetic resonance imaging; PET, positron emission tomography; SLNB, sentinel lymph node biopsy.

[†]This table is based on the subset of dermatologists who reported that they would usually discuss and recommend SLNB with their patients, if they were eligible for SLNB.

[‡]Respondents could select more than one answer.

[§]The current Australian melanoma management guidelines state that sentinel lymph node biopsy should be considered for all patients with melanoma >1 mm in thickness and for patients with melanoma >0.75 mm with other high-risk pathological features.[10]

[¶]Free-text responses included: follow advice from the melanoma unit or specialist surgeon (n = 6); discuss with patient (n = 2); order scans but after the result of the SLNB (n = 1); order tests only if indicated (n = 1).

being unconvinced about the utility of SLNB and not adhering to the recommendations (n = 2) (Figure 1). Mapping of the themes to the Flottorp determinants of practice framework[27] identified factors that might be influencing attitudes to SLNB, adherence to the recommendations and, importantly, in driving any changes in attitudes towards SLNB among the interviewees (Figure 1; Supplementary file S3).

Concerns about SLNB

For some dermatologists, concerns about SLNB could be traced back to specialist dermatology training and to a normative belief about the position they believed dermatologists were expected to take in relation to SLNB in order to pass their Fellowship examinations. Several indicated that

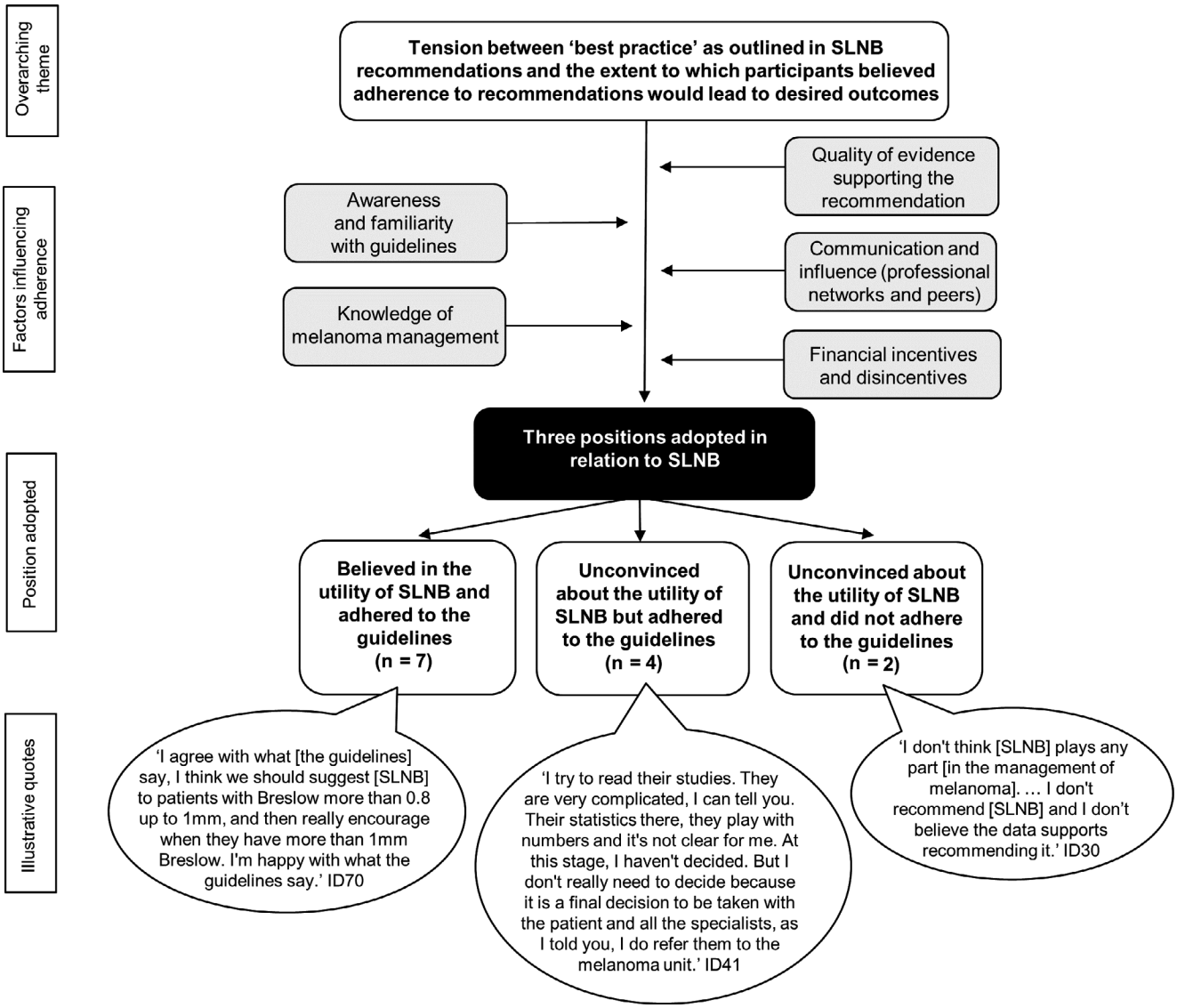

Figure 1 Factors identified as influencing adherence to SLNB recommendations, and the differing positions adopted by interviewees in relation to SLNB. Factors influencing adherence are based on the Flottorp determinants of practice framework.[27]

it had been emphasised to them that SLNB 'is a test, it's not a treatment' [ID61] and furthermore it is a 'test with risk' [ID23] and of limited use in melanoma management. One interviewee commented on the problem of the apprentice-style system in promoting such normative beliefs and in perpetuating practice that might now be out of step with current recommendations. This appeared to be particularly pertinent given the changing evidence regarding SLNB over the period since many of these dermatologists underwent training.

It was apparent that many participants wanted to understand what was 'the right thing' to do, but that this was difficult in light of what was perceived to be a conflicted and contested evidence base around SLNB. The fluctuating evidence to which many participants referred was the data on the purported survival benefit that SLNB [and a subsequent complete lymph node disection (CLND) for SLNB-positive patients] provided to melanoma patients.[30] To many participants, the logic behind the SLNB and CLND procedures was flawed. Many interviewees stressed that melanoma spread not just through the lymphatic system but also haematogenously. This meant that detection of micrometastases within the lymph nodes and removal of lymph nodes in the affected lymph node basin was not necessary, and did nothing to improve survival over observation and monitoring of the nodes, while at the same time potentially exposing the patient to avoidable morbidity such as lymphoedema.

Changes in the melanoma management landscape driving changes in attitudes to SLNB

Attitudes towards SLNB were not fixed. Instead, attitudes appeared to be closely related to interviewees' perception

of how adherence to the SLNB recommendations would lead to desired outcomes (Figure 2). Several interviewees indicated that in the past 5 years there had been a shift in their attitude towards SLNB. Two factors were identified as being instrumental in changing attitudes. The first was the reporting in 2016 and 2017, respectively, of the DeCOG-SLT and MLST-II randomised controlled trial results.[3,4] Both of these studies concluded that a CLND in SLN-positive patients did not improve survival. Until then a CLND had been standard practice in patients who tested SLN-positive. The trial results and the consequent changes to clinical practice guidelines in Australia seemed to have been critical in driving a shift in thinking about SLNB among some of the interviewees. In particular, interviewees stated that their previously held concerns about a SLNB leading to a CLND were now removed.

A game-changer for many was the availability of potentially effective adjuvant systemic therapies for the treatment of patients with resected stage III melanoma and the reimbursement of these therapies by the Australian Pharmaceutical Benefits Scheme (PBS), the scheme that determines which pharmaceuticals are subsidised by the Australian Government. Many of the dermatologists indicated that in light of the availability of these new treatments, they believed the role of SLNB in melanoma management was changing. They felt that even though SLNB was still a 'test and not a treatment' it now provided an entry point to treatments that could potentially improve survival for stage III melanoma patients. However, while acknowledging the new role for SLNB, at the same time some expressed concern that SLNB was being used as the 'gateway' to adjuvant systemic therapies. In Australia, SLNB is currently a prerequisite for entry to many of the clinical trials of adjuvant systemic immunotherapies, and it is required for accessing them on Australia's government-funded PBS. Some interviewees indicated that they believed it was inappropriate that a 'complex invasive procedure' such a SLNB was being used as the diagnostic test to identify patients who might potentially benefit from receiving these new therapies. In contrast, others indicated that while they believed that SLNB was not perfect, for example a negative SLNB did not guarantee that a patient was not at risk of developing distant metastases, at the moment it was the best diagnostic test available.

A small number of interviewees indicated that some dermatologists might be resistant to change owing to the financial incentives around performing a wide local excision rather than referring for consideration of SLNB. Once referred, even if the patient decided not to have a SLNB, it is likely the surgeon, rather than the dermatologist, would perform the wide local excision. From the dermatologists' perspective, referral therefore meant losing that patient to a surgeon.

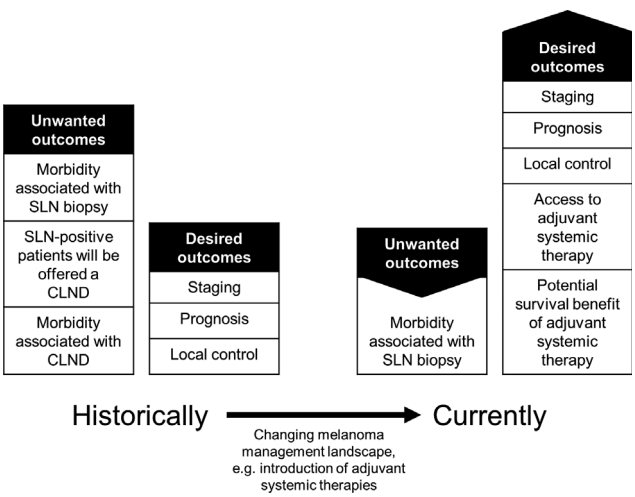

Figure 2 Outcomes associated with adherence to SLNB recommendations, as reported by interviewees, and how these have changed over time.

Influence of professional networks, colleagues and key opinion leaders

Both the questionnaire and interview data indicated that it did not automatically follow that a dermatologist who was unconvinced about the utility of SLNB would not adhere to the SLNB guidelines. Instead, as Figure 1 indicates, even among the interviewees who were unconvinced about the utility of SLNB, most indicated that they would adhere to the guidelines and would refer relevant patients to a specialist melanoma unit or surgeon for discussion of SLNB. In these individuals, it appeared that a critical factor influencing how they behaved was the trust they placed in colleagues or the centres of expertise to which they were referring patients. Another critical factor influencing attitudes to SLNB was what an individual had read or heard about SLNB. Several participants commented on the strong opinions held by some Australian clinicians, about the 'shouting match about sentinel lymph node biopsy' [ID74] at some conferences, and about how they relied not just on guidelines but on online dermatology chat groups, journal clubs and annual dermatology college meetings to update their knowledge on SLNB. However, for many, it was the influence of peers and those with whom they worked closely that provided the greatest influence on their attitudes to SLNB; this was particularly noticeable among the dermatologists who worked within or were closely associated with melanoma units or melanoma multidisciplinary teams.

DISCUSSION

This study is the first to provide an in-depth account of the knowledge and attitudes of dermatologists towards SLNB, and to systematically identify important personal and contextual factors influencing knowledge and attitudes. The study demonstrates that despite almost all dermatologists reporting that they would discuss and recommend SLNB with an eligible patient, just under half reported that they were unsure or did not believe that SLNB had an important role to play in melanoma management. In addition, one-third indicated that they would not advise a patient

Table 3 Inductively derived themes and illustrative quotes

Themes	Illustrative quotes
1. Concerns about utility of SLNB	'That's the flaw in this apprentice style of system where the practice is coming from what everyone is doing. We're doing what our predecessors - our supervisors - have done. But it means that if there's a flaw, it's a huge systematic flaw.' ID74
	'I think the evidence for and against [SLNB] in various circumstances has fluctuated over time. It's almost like the stock market in a way. After a while you become a little bit numb to it and you almost do just kind of form your own ideas about it.' ID74
2. Changes in melanoma management landscape driving changes in attitudes to SLNB	'So my approach to [SLNB] has changed since we've had more recent studies… I am very happy that [a positive SLN] no longer translates into a complete lymph node dissection. I think that's an important advancement.' ID34
	'[SLNB] has obviously now become the gateway to getting onto various adjuvant treatments, so if that's the case, then it's important that we need to give people the opportunity to get onto those [treatments]… if we don't do a sentinel node biopsy where there's no other reason not to do it, then they might potentially be denied the availability of something that might make a difference to them.' ID44
	'My dream is to have a patient with a high-risk primary tumour and say, you are at a very high risk of metastases we're going to put you on the medication straight away. I think that's eventually going to happen. But at this stage you need a sentinel node.' ID23
	'I think the surgeons have made a lot of money doing [SLNB], which I'm certain were well-intentioned… But at the same time, there's a huge economic incentive for [dermatologists] to do the wide local excision because we get paid so much more for it. We don't get paid for making an intelligent decision, we're getting paid for doing [a procedure].' ID61
3. Influence of professional networks, colleagues and key opinion leaders	'They're a centre of expertise and there are new things coming up all the time. They're a specialised place therefore they're very, very up to date with what's happening. I think not just they're up to date, they're able to implement the things that happen very quickly.' ID77
	'Probably the meetings and the networking is really where you really get your main - the annual meeting - the main injection of what's new and what's controversial.' ID61

with a melanoma with a Breslow thickness 1.01–2.00 mm (or 0.80–1.00 mm with high-risk pathological features) that a SLNB was appropriate and would not refer that patient to a surgeon for management. Taken together, these findings point to potential gaps in dermatologists' knowledge or a lack of agreement with the Australian melanoma guidelines' SLNB recommendations, both of which are known barriers to guideline adherence.[31]

Multiple factors were identified as influencing dermatologists' attitudes towards SLNB, adherence to SLNB recommendations in the guidelines, and in driving changes in attitudes towards SLNB. These include an awareness and familiarity with the guidelines, knowledge of melanoma management including the role of adjuvant systemic therapy, perceptions of the quality of evidence supporting the recommendation, and the influence of health care professional networks and peers. Furthermore, this study identified that a potential modifier of dermatologists' behaviour was the relationship the dermatologist had with a centre of expertise in melanoma management or with the surgeons to whom they referred patients. Trust in these colleagues, and a belief that they would act in the patients' best interests, meant that dermatologists were prepared to refer patients for consideration of SLNB despite their personal reservations about its role. These findings align with what others have reported about the complex interplay of personal, interpersonal and system factors in achieving evidence-based practice.[32]

This study also demonstrated that attitudes to SLNB among dermatologists are changing in response to the rapidly changing melanoma treatment landscape. The MLST-II and DeCOG-SLT clinical trial data, which altered the surgical management of lymph node disease in melanoma around the world,[3,4] were rapidly followed by clinical trial data for adjuvant systemic therapies including immunotherapy and targeted molecular therapy and this has similarly changed how high-risk melanoma patients are managed.[6–8] Furthermore, in Australia, adjuvant systemic therapies are now available on the PBS to patients who have stage IIIB, IIIC or IIID disease, and the Australian Therapeutic Goods Association has approved use of adjuvant systemic therapies in patients who are stage IIIA. Most dermatologists were aware of these changes in melanoma management and the resulting shift in role for SLNB from being a diagnostic test to identify patients for CLND, to being a test to identify patients who are likely to benefit from adjuvant systemic therapy. In the current study, the increasingly complex, multidisciplinary nature of melanoma management, and in particular the need to consider involving a multidisciplinary team, appeared to be a critical factor driving changes in dermatologists' attitudes to SLNB and their inclination to refer patients for consideration of SLNB.

Strengths and limitations

Our analysis of factors related to knowledge and attitudes were based on a relatively small survey sample and were not adjusted for multiple comparisons, so should be considered exploratory rather than definitive.[33,34] A strength of this research is its integrated mixed methods design.[35,36] Use of the comprehensive Flottorp framework allowed systematic identification of barriers and enablers of guideline implementation and use.[27] It is possible the views expressed are not representative of Australian dermatologists; however, in attending the two major Australian dermatology meetings, we believe we engaged a representative sample, recruiting about 20% of practising dermatologists. At the time dermatologists were surveyed, adjuvant systemic therapy was not listed on the PBS. Since then several therapies have been approved for PBS funding. Clinical trials of adjuvant systemic therapy for patients with a negative SLNB have also commenced.

CONCLUSIONS

Although most of the dermatologists surveyed were familiar with and follow the SLNB recommendations, some disagreement with and distrust of the recommendations was evident. Greater acceptance of the SLNB recommendations appeared to be driven by the improved outcomes demonstrated in stage III patients receiving adjuvant systemic therapy. Dermatologists are increasingly aware that advances in melanoma management mean optimal care for higher-risk patients is likely to require input from a multidisciplinary team of specialists with in-depth knowledge of contemporary practice and management options. This study highlights the importance of having clear guidance from an organisation that clinicians perceive to be credible and trustworthy. The Australasian College of Dermatologists, in recognition of the rapid changes within melanoma management and the need for clearer guidance to its members, has recently released a statement on SLNB.[37] The findings from the current study indicate that statements such as this may have an important role to play in addressing gaps in knowledge and dispelling uncertainty over appropriate practice in relation to SLNB for patients with higher-risk melanomas in Australia.

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ETHICAL APPROVAL

Approval to conduct this research was received from the Human Research Ethics Committee of The University of Sydney, Australia (Protocol Number: 2018/713).

REFERENCES

1. Australian Institute of Health and Welfare (AIHW). *Cancer in Australia 2019*. Cancer series no. 119. Cat. No. CAN 123. Canberra: AIHW.
2. Amin MB, Edge SB, Greene FL (eds). AJCC Cancer Staging Manual, 8th edn. New York: Springer, 2017.
3. Faries MB, Thompson JF, Cochran AJ *et al*. Completion dissection or observation for sentinel-node metastasis in melanoma. *New Engl. J. Med.* 2017; **376**: 2211–22.
4. Leiter U, Stadler R, Mauch C *et al*. Complete lymph node dissection versus no dissection in patients with sentinel lymph node biopsy positive melanoma (DeCOG-SLT): a multicentre, randomised, phase 3 trial. *Lancet Oncol.* 2016; **17**: 757–67.
5. Gershenwald JE, Scolyer RA, Hess KR *et al*. Melanoma staging: Evidence-based changes in the American Joint Committee on Cancer eighth edition cancer staging manual. *CA Cancer J. Clin.* 2017;**67**:472–92.
6. Long GV, Hauschild A, Santinami M *et al*. Adjuvant dabrafenib plus trametinib in stage III BRAF-mutated melanoma. *New Engl. J. Med.* 2017; **377**: 1813–23.
7. Weber J, Mandala M, Vecchio M *et al*. Adjuvant nivolumab versus ipilimumab in resected stage III or IV melanoma. *New Engl. J. Med.* 2017; **377**: 1824–35.
8. Eggermont A, Blank CU, Mandala M *et al*. Adjuvant pembrolizumab versus placebo in resected stage III melanoma. *New Engl. J. Med.* 2018; **378**: 1789–801.
9. Schuchter LM. Adjuvant melanoma therapy — head-spinning progress. *New Engl. J. Med.* 2017; **377**: 1888–1890.
10. *Cancer Council Australia Melanoma Guidelines Working Party. Clinical practice guidelines for the diagnosis and management of melanoma*. Sydney: Cancer Council Australia. Available from: https://wiki.cancer.org.au/australia/Guidelines:Melanoma.
11. Watts CG, Madronio CM, Morton RL *et al*. Diagnosis and clinical management of melanoma patients at higher risk of a new primary melanoma: A population-based study in New South Wales, Australia. *Australas. J. Dermatol.* 2017; **58**: 278–85.
12. McGregor JM, Sasieni P. Sentinel node biopsy in cutaneous melanoma: time for consensus to better inform patient choice. *Br J Dermatol.* 2015; **172**: 552–4.
13. Zagarella S. Sentinel lymph node biopsy still provides no benefits for patients with melanoma. *Am. J. Dermatopathol.* 2020; **1**: 481–485.
14. Sladden M, Zagarella S, Popescu C *et al*. The sentinel node biopsy has not come of age. *Br. J. Dermatology*. 2019; **182**: 518.
15. Bigby M, Zagarella S, Sladden M *et al*. Time to reconsider the role of sentinel lymph node biopsy in melanoma. *J. Am. Acad. Dermatol.* 2018; **80**: 1168–1171.
16. Smithers MB, Hughes MB, Beesley VL *et al*. Prospective study of patterns of surgical management in adults with primary cutaneous melanoma at high risk of spread, in Queensland, Australia. *J. Surg. Oncol.* 2015; **112**: 359–65.
17. Varey AH, Madronio CM, Cust AE *et al*. Poor adherence to national clinical management guidelines: a population-based, cross-sectional study of the surgical management of melanoma in New South Wales, Australia. *Ann. Surg. Oncol.* 2017; **24**(8): 2080–8.
18. Silva E. Adjunct primer for the use of national comprehensive cancer network guidelines for the surgical management of cutaneous malignant melanoma patients. *World J. Surg. Oncol.* 2012; **10**: 54.
19. Grange F, Vitry F, Granel-Brocard F *et al*. Variations in management of stage I to stage III cutaneous melanoma: a population-based study of clinical practices in France. *Arch. Dermatol.* 2008; **144**: 629–36.
20. Sharouni M-AE, Witkamp AJ, Sigurdsson V *et al*. Trends in sentinel lymph node biopsy enactment for cutaneous melanoma. *Ann. Surg. Oncol.* 2019; **26**: 1494–502.

21. Watts C, Smith AL, Robinson S *et al*. Australian general practitioners' attitudes and knowledge of sentinel lymph node biopsy in melanoma management. *Aust. J. Gen. Pract.* 2020; **49**: 355–62.
22. Sandelowski M. Combining qualitative and quantitative sampling, data collection, and analysis techniques in mixed-method studies. *Res. Nurs. Health.* 2000; **23**: 246–55.
23. Australian Bureau of Statistics (ABS)*Socio-Economic Indexes for Areas (SEIFA): The Index for Relative Socio-Economic Advantage and Disadvantage*. Canberra: ABS. 2018.
24. McNutt L-A, Wu C, Xue X *et al*. Estimating the relative risk in cohort studies and clinical trials of common outcomes. *Am. J. Epidemiol.* 2003; **157**: 940–3.
25. Braun V, Clarke V. Reflecting on reflexive thematic analysis. *Qual. Res. Sport Exerc. Heal.* 2019; **11**: 1–9.
26. Braun V, Clarke V. Using thematic analysis in psychology. *Qual. Res. Psychol.* 2006; **3**: 77–101.
27. Flottorp SA, Oxman AD, Krause J *et al*. A checklist for identifying determinants of practice: A systematic review and synthesis of frameworks and taxonomies of factors that prevent or enable improvements in healthcare professional practice. *Implement. Sci.* 2013; **8**: 35.
28. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int. J. Qual. Health Care* 2007; **19**: 349–57.
29. von Elm E, Altman DG, Egger M *et al*. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Int. J. Surg.* 2014; **12**: 1495–9.
30. Morton DL, Thompson JF, Cochran AJ *et al*. Final trial report of sentinel-node biopsy versus nodal observation in melanoma. *New Engl. J. Med.* 2014; **370**: 599–609.
31. Cabana MD, Rand CS, Powe NR *et al*. Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA* 1999; **282**: 1458–65.
32. Grol R, Wensing M. What drives change? Barriers to and incentives for achieving evidence-based practice. *Medical J. Australia* 2004; **180**(6 Suppl): S57–60.
33. Streiner DL, Norman GR. Correction for multiple testing is there a resolution? *Chest* 2011; **140**: 16–8.
34. Rothman KJ. No adjustments are needed for multiple comparisons. *Epidemiology* 1990; **1**: 43–6.
35. Moran-Ellis J, Alexander VD, Cronin A *et al*. Triangulation and integration: processes, claims and implications. *Qual. Res.* 2006; **6**: 45–59.
36. Willson ML, Vernooij RWM, Gagliardi AR *et al*. Questionnaires used to assess barriers of clinical guideline use among physicians are not comprehensive, reliable, or valid: a scoping review. *J. Clin. Epidemiol*. 2017;**86**:25–38.
37. Mar V, Kelly J, Soyer HP *et al*. Sentinel node biopsy in 2020: a guide for Australian dermatologists [Internet]. Sydney, Australia: Australasian College of Dermatologists, 2020. Available from: https://www.dermcoll.edu.au/wp-content/uploads/2020/01/ACD-Guide-for-Sentinel-Node-Biopsy-in-2020-Jan-2020.pdf.
38. Australian Bureau of Statistics (ABS). *The Australian Statistical Geography Standard (ASGS) remoteness structure*. ABS. 2018.

APPENDIX 1

Australian Melanoma Centre of Research Excellence Study Group: J Braithwaite (Australian Institute of Health Innovation, Macquarie University, Sydney, NSW, Australia), DE Gyorki (Peter MacCallum Cancer Centre, Melbourne, VIC, Australia), M Henderson (Peter MacCallum Cancer Centre, Melbourne, VIC, Australia), AM Hong (Melanoma Institute Australia, The University of Sydney, Sydney, NSW Australia), JW Kelly (Victorian Melanoma Service, The Alfred Hospital, Melbourne, VIC, Australia), GV Long (Melanoma Institute Australia, The University of Sydney, Sydney, NSW Australia; The Faculty of Medicine and Health, The University of Sydney, Sydney, NSW Australia; Department of Medical Oncology, Royal North Shore Hospital, Sydney, NSW, Australia; Mater Hospital, Sydney, NSW, Australia), AM Menzies (Melanoma Institute Australia, The University of Sydney, Sydney, NSW Australia; The Faculty of Medicine and Health, The University of Sydney, Sydney, NSW Australia; Department of Medical Oncology, Royal North Shore Hospital, Sydney, NSW, Australia; Mater Hospital, Sydney, NSW, Australia), RL Morton (Melanoma Institute Australia, The University of Sydney, Sydney, NSW Australia; NHMRC Clinical Trials Centre, The University of Sydney, Sydney, NSW Australia), RPM Saw (Melanoma Institute Australia, The University of Sydney, Sydney, NSW Australia; The Faculty of Medicine and Health, The University of Sydney, Sydney, NSW Australia; Mater Hospital, Sydney, NSW, Australia), RA Scolyer (Melanoma Institute Australia, The University of Sydney, Sydney, NSW Australia; The Faculty of Medicine and Health, The University of Sydney, Sydney, NSW Australia; Tissue Pathology and Diagnostic Oncology, Royal Prince Alfred Hospital and New South Wales Health Pathology, Sydney, NSW Australia), AJ Spillane (Melanoma Institute Australia, The University of Sydney, Sydney, NSW Australia; The Faculty of Medicine and Health, The University of Sydney, Sydney, NSW Australia; Department of Medical Oncology, Royal North Shore Hospital, Sydney, NSW, Australia; Mater Hospital, Sydney, NSW, Australia), GJ Mann (Melanoma Institute Australia, The University of Sydney, Sydney, NSW Australia; The John Curtin School of Medical Research, Australian National University, Canberra, ACT Australia).

Supporting Information

Additional Supporting Information may be found online in Supporting Information:

File S1. Survey and interview guide.
File S2. Integration of survey and interview data.
File S3. Inductively derived themes mapped to the Flottorp et al. determinants of practice framework, with illustrative quotes.