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ORIGINAL ARTICLE – MELANOMAS

How Often Do Patients with Localized Melanoma Attend Follow-Up at a Specialist Center?

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ABSTRACT

Background. Post-treatment follow-up for patients with American Joint Committee on Cancer (AJCC) stage I/II melanoma is believed to be important for early detection of disease recurrence and new primary melanomas, but comes with costs to both patients and healthcare providers. We aimed to determine how frequently a cohort of patients attended follow-up after surgical treatment at one Specialist Center.

Methods. We used prospectively collected data from the Melanoma Institute Australia (MIA) for patients with AJCC stage I/II melanoma diagnosed between January 2008 and December 2011. The distribution of the number of recorded follow-up visits per patient was analyzed and compared with the number of follow-up visits recommended in the 2008 Australian and New Zealand Melanoma Management Guidelines.

Results. A total of 3813 patients with stage I/II melanoma were identified. During the first year of follow-up post-surgery, 34 % of stage I patients and 14 % of stage II patients had the number of follow-up visits recommended in the guidelines. A large proportion of melanoma patients did not appear to be routinely followed up at MIA, with 43.2 % of stage I patients and 28.7 % of stage II patients having either no visit or only one visit post-surgery. During all years of follow-up, 13.2 % of stage I patients and 4.1 % of stage II patients had the number of follow-up visits at the specialist center as recommended in the guidelines.

Conclusions. The large proportion of patients who had fewer follow-up visits than expected suggests (i) many patients are followed up in clinics elsewhere, and/or (ii) post-surgical surveillance is less frequent in practice.

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Worldwide, it is estimated that there are 197,000 new cases of melanoma per year and 46,000 deaths due to melanoma globally.[1] The risk of cutaneous melanoma in Australia and New Zealand is two to three times higher than most other western countries, with a person's lifetime risk being 3.6 % compared with 1.9 % in the US.[2] Cutaneous melanoma is the fourth most common cancer in Australia, and the seventh most common cause of death from cancer; its estimated incidence in 2012 for men and women was 7440 (62.7 per 100,000) and 5070 (39.9 per 100,000), respectively.[3] Clinical Practice Guidelines for the Management of Melanoma in Australia and New Zealand were updated in 2008 and recommend 6-monthly follow-up visits for 5 years for patients with American Joint Committee on Cancer (AJCC) stage I disease, 3- or 4-monthly visits for 5 years for patients with stage II/III disease, and yearly thereafter for all patients. These recommendations were based on expert opinion and were not evidence based.

Post-treatment follow-up for patients with AJCC stage I/II melanoma is believed to be important for early detection of disease recurrence and new primary melanomas but comes with costs to both patients and healthcare providers. Previous research indicates that the majority of melanoma recurrences (up to 73 %) are detected by patients, their partners, or relatives,[4,5] suggesting that follow-up

frequency could be reduced without substantial increases in the number of patients with a delay in detection of recurrence or a new primary melanoma.[6] Long-term routine follow-up for early-stage melanoma is often performed as shared care between melanoma surgeons, dermatologists, and primary care physicians.[7] While the types of shared care practiced by clinicians undertaking post-treatment follow-up at the Melanoma Institute Australia (MIA) have been described, the proportion of patients attending these various follow-up pathways is unknown. It is also unclear to what degree patient attendance for follow-up corresponds to practice guidelines.

Our study investigated the frequency of patient follow-up using routinely collected records for a cohort of patients diagnosed and treated at the MIA. The objective of the study was to describe the frequency and timing of patient follow-up after surgical treatment for stage I/II melanoma, and to compare these with the recommendations in the current Australia and New Zealand guidelines.

METHODS

Study Design and Sample

We examined follow-up records of 3813 consecutive patients diagnosed with AJCC stage I/II melanoma treated at the MIA between 1 January 2008, and 31 December 2011. All records were obtained up to 11 June 2013, ensuring at least 1 year of follow-up since initial definitive treatment. Sixty-six patients were excluded because they had follow-up records prior to their primary diagnosis, suggesting previous melanoma; they died from melanoma but had no recurrence or second primary recorded; or there were insufficient data to allow classification of the melanoma as stage I/II using 2009 AJCC criteria.[8] The remaining 3747 patients were included in the analysis. The study was approved by the University of Sydney Human Research Ethics Committee (Project No. 2013/930).

Routinely Collected Follow-Up Records

The dataset included records for patients who attended for follow-up with an MIA clinician. In general, patients who missed a follow-up appointment were contacted by MIA administrative staff to reschedule the appointment. These follow-up records also contained pathology results. We included patient records up until either the end of the study period or the patient developed a recurrence or new primary melanoma, whichever occurred first. We excluded further follow-up records for patients with a recurrence or new primary melanoma because their follow-up would then be different, usually with more intensive surveillance. Recurrences and new primaries were diagnosed by histopathology (including cytology) and imaging. These records have been used to indicate when follow-up visits occurred with an MIA clinician, and we use the terms 'records' and 'visits' interchangeably. We investigated the impact of multiple records associated with one follow-up visit that may occur when pathology results and test procedures were recorded in the patient record at a similar time to the visit (see Appendix Tables 5, 6).

Statistical Analysis

Summary statistics were calculated for patient characteristics, including age at diagnosis, sex, diagnosis year, anatomic site of primary lesion, AJCC stage at initial presentation, recurrence or new primary melanoma.

The number of follow-up visits was tabulated by the length of follow-up for periods of 1, 2, 3 and 4 years (0–1, 0–2, 0–3, and 0–4 years) after diagnosis. For each period, we only included patients who had been followed up for at least that period of time. χ^2 tests were used to test whether the distribution of the number of records were similar by year of diagnosis. We compared the number of MIA visits for each follow-up period with the number of follow-up visits recommended by the 2008 Australian and New Zealand melanoma guidelines.[9] Histograms of follow-up visit distributions for each period were generated.

The number of patients with no follow-up visits, a single follow-up visit, and two or more follow-up visits was calculated. The latter were classified as having ongoing follow-up if they had at least one record between January 2012 and June 2013, and as having ceased follow-up if they had no visits in the last 18 months of the study from January 2012 to June 2013.

All analyses were carried out using SAS statistical package, version 9.3 (SAS Institute, Inc., Cary, NC, USA).

RESULTS

The majority of patients had AJCC stage I disease (69.9 %), were male (58.2 %), and the most common age group was 60–69 years (24.3 %, mean 60.4 years with a standard deviation of 15.9 years) (Table 1). Overall 10.9 % of patients had a first event of recurrence and 6.4 % had a first event of new primary melanoma during the study period. The median follow-up times were 3.2 and 2.5 years for patients with stage I and II melanomas, respectively.

Table 2 shows the distribution of the number of follow-up visits for all patients. Patients contributed only to columns where they had sufficient follow-up time since diagnosis. The first year of follow-up had the highest proportion of patients, with follow-up visit numbers

TABLE 1 Demographic summary of 3747 patients treated for localized primary cutaneous melanoma

Characteristic	No. of patients	%
AJCC stage of disease		
I	2618	69.9
II	1129	30.1
First event[a]		
None	3100	82.7
Recurrence	407	10.9
Second primary	240	6.4
Primary site		
Leg/arm	1761	47.0
Trunk	1194	31.9
Head/neck	791	21.1
Other	1	0.03
Sex		
Female	1565	41.8
Male	2182	58.2
Age (years)		
<40	456	12.2
40–49	504	13.5
50–59	778	20.8
60–69	909	24.3
70–79	647	17.3
≥80	453	12.1
Year diagnosed		
2008	882	23.5
2009	952	25.4
2010	957	25.5
2011	956	25.5

AJCC American Joint Committee on Cancer

[a] The first event is defined as 'none' if there were no events across the follow-up time, 'recurrence' if their first event was a recurrence regardless of subsequent new primaries or other recurrences, and 'second primary' if this occurred before any subsequent recurrences

corresponding to those recommended by the guidelines for both AJCC stage I (33.8 %) and stage II (13.9 %) patients. After the first year of follow-up, the proportion of patients whose number of follow-up visits corresponded to the number recommended by guidelines became lower and continued to drop with each additional year of follow-up. Figure 1a–d show the distributions of numbers of visits for 1 and 2 years of follow-up by AJCC stage.

First, the distribution of the number of visits by each year of diagnosis was examined to check for any cohort effects. χ^2 tests showed this distribution of visits did not change significantly by diagnosis year stage I ($\chi^2 = 16.04$, 15 degrees of freedom [DF], $p = 0.38$), stage II ($\chi^2 = 15.76$, 15 DF, $p = 0.40$) when comparing visits in the first year of follow-up only, nor were there differences in the first 2 years of follow-up for stage II ($\chi^2 = 7.35$, 16 DF, $p = 0.97$). Although there was some evidence of differences in the number of follow-up visits by year of diagnosis over the first 2 years of follow-up for stage I patients ($\chi^2 = 24.29$, 14 DF, $p = 0.042$), investigation of the frequency table did not show any clear pattern across the different years; therefore, we did not stratify by year of diagnosis for the analyses.

Table 3 shows patient demographic and disease characteristics by stage and number of follow-up visits. Many patients with histopathology showing a recurrence or second primary had no follow-up visits with the MIA before this, suggesting further disease was often detected outside of a scheduled visit at the specialist center. Routine follow-up appeared less likely for stage I melanoma patients with very thin tumors: fewer patients had two or more follow-up visits when the Breslow thickness was <0.75 mm (47.8 %) compared with when thickness was ≥0.75 mm (66.6 %). Females, patients in younger age groups, and those who did not experience recurrence or new primary melanomas had, on average, two or more follow-up visits in both stage groups.

An estimated 56.8 % of AJCC stage I patients and 71.3 % of stage II patients appeared to be routinely followed up at the MIA (Table 4). Of the patients who had two or more visits, not all appeared to have ongoing follow-up at the MIA, with 21.2 % of stage I and 22.3 % of stage II patients having no visits in the last 18 months of the study period.

Overall, few patients had visits that would indicate they were being followed up at the MIA strictly according to the current melanoma follow-up guidelines, with only 13.2 % of stage I patients and 4.1 % of stage II patients attending as per the guideline recommendations. These proportions were lower still for patients with ongoing follow-up: after excluding patients with no follow-up records in the last 18 months, 6.5 % of stage I patients and 1.2 % of stage II patients had follow-up according to guidelines. Among patients who had records indicating follow-up in accordance with guidelines, there were 7 (2 %) recurrences and 13 (4 %) new primary melanomas detected for patients with stage I disease and 15 (33 %) recurrences and 1 (2 %) new primary melanoma detected for patients with stage II disease.

DISCUSSION

We found that the number of follow-up visits for patients at the MIA was heterogeneous, and few of them had follow-up according to the recommendations of the Australian and New Zealand 2008 guidelines for patients with AJCC stage I/II cutaneous melanoma. That a large proportion of patients were not being followed up at the

TABLE 2 Number of follow-up visits in the specified years of follow-up for patients with stage I and II melanoma

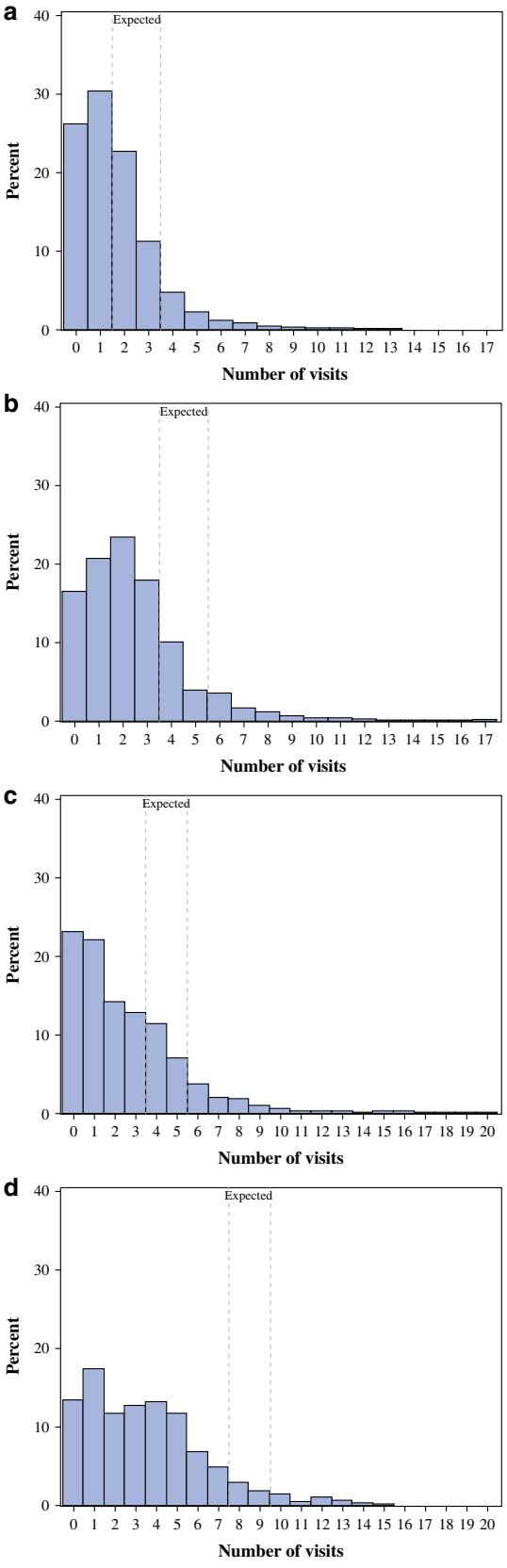
Records	No. of stage I patients followed-up for:				No. of stage II patients followed up for:			
	1 year	2 years	3 years	4 years	1 year	2 years	3 years	4 years
No recorded visits	685 (26.2)	452 (23.0)	271 (20.7)	125 (19.9)	186 (16.5)	111 (13.4)	62 (11.8)	34 (13.4)
1	794 (30.3)	432 (22.0)	273 (20.8)	115 (18.3)	233 (20.6)	144 (17.4)	92 (17.6)	46 (18.1)
2	**592 (22.6)**	278 (14.2)	177 (13.5)	78 (12.4)	264 (23.4)	97 (11.7)	64 (12.2)	25 (9.8)
3	**293 (11.2)**	251 (12.8)	124 (9.5)	52 (8.3)	202 (17.9)	105 (12.7)	56 (10.7)	30 (11.8)
4	123 (4.7)	**223 (11.4)**	109 (8.3)	53 (8.4)	**113 (10.0)**	109 (13.2)	45 (8.6)	18 (7.1)
5	58 (2.2)	**137 (7.0)**	101 (7.7)	34 (5.4)	**44 (3.9)**	97 (11.7)	37 (7.1)	10 (3.9)
6	29 (1.1)	73 (3.7)	**87 (6.6)**	40 (6.4)	40 (3.5)	56 (6.8)	48 (9.2)	13 (5.1)
7	22 (0.8)	38 (1.9)	**64 (4.9)**	39 (6.2)	18 (1.6)	40 (4.8)	32 (6.1)	21 (8.3)
8	8 (0.3)	35 (1.8)	35 (2.7)	**33 (5.3)**	12 (1.1)	**24 (2.9)**	22 (4.2)	17 (6.7)
9	6 (0.2)	17 (0.8)	29 (2.2)	**24 (3.8)**	7 (0.6)	**15 (1.8)**	24 (4.6)	5 (2.0)
10	4 (0.2)	10 (0.5)	10 (0.8)	14 (2.2)	4 (0.4)	12 (1.5)	12 (2.3)	7 (2.8)
11	3 (0.1)	5 (0.3)	14 (1.1)	11 (1.8)	3 (0.3)	3 (0.4)	13 (2.5)	7 (2.8)
12	–	2 (0.1)	8 (0.6)	3 (0.5)	2 (0.2)	8 (1.0)	**7 (1.3)**	6 (2.4)
13	1 (0.04)	2 (0.1)	1 (0.1)	2 (0.3)	–	5 (0.6)	**2 (0.4)**	10 (3.9)
14	–	1 (0.1)	1 (0.1)	4 (0.6)	–	2 (0.2)	2 (0.4)	2 (0.8)
15	–	3 (0.2)	1 (0.1)	–	–	1 (0.1)	2 (0.4)	–
16	–	2 (0.1)	1 (0.1)	–	–	–	2 (0.4)	**1 (0.4)**
17	–	–	–	–	1 (0.1)	–	1 (0.2)	**1 (0.4)**
18	–	–	2 (0.2)	–	–	–	–	–
20	–	1 (0.1)	–	1 (0.2)	–	–	1 (0.2)	–
23	–	–	–	–	–	–	–	1 (0.4)
Total	2618 (100)	1962 (100)	1308 (100)	628 (100)	1129 (100)	829 (100)	524 (100)	254 (100)
Number of visits recommended by guidelines	2 or 3	4 or 5	6 or 7	8 or 9	4 or 5	8 or 9	12 or 13	16 or 17

Data are expressed as *n* (%)

Bold values indicate indicates the number of records that corresponds to visits recommended by the 2008 Australian and New Zealand guideline

specialist center where they had been treated suggests that patients may attend follow-up less regularly than recommended by guidelines, undertake follow-up in part or totally with their local doctor or dermatologist, or a combination of the two. Previous qualitative research among MIA patients indicates that many patients could have been undergoing follow-up in a form of shared care, although this proportion is currently unknown.[7] Many of the patients diagnosed with a recurrence or a new primary melanoma by histopathology had no follow-up records with the MIA (prior to this diagnosis), suggesting that the clinical diagnosis occurred outside of the specialist center. A few of the patients who strictly adhered to guidelines also had recurrent or new melanomas diagnosed. It is unknown whether these were first detected by the MIA doctor or by the patient/family/general practitioner in-between visits. Not surprisingly, around half of the low-risk AJCC stage I patients with very thin tumors (Breslow thickness <0.75 mm) had little follow-up at the MIA, and were likely referred back to their primary clinician for routine follow-up.

A number of studies have looked at the management and monitoring of melanoma. In one of these studies, a less frequent follow-up schedule, using AJCC substage, was proposed based on the risk of disease recurrence.[10] The adequacy of this less frequent follow-up strategy was supported by research that showed only small differences in modeled delay in diagnosis of recurrence or a new primary when compared with the follow-up schedule recommended in the current guidelines.[6] Other research has indicated that routine surveillance imaging in detection of melanoma recurrences would result in no or a minimal increase ($\leq$2 months) in life expectancy for patients with early-stage melanoma.[11] Our findings of fewer follow-up visits than recommended in the guidelines indicates that, at least in the specialist setting, less frequent follow-up is already occurring in everyday practice.



◀**FIG. 1** Distribution of visits in the first year and 2 years of follow-up for patients with AJCC stage I and II melanoma. **a** Stage I melanoma patients followed-up for 1 year; **b** stage II melanoma patients followed-up for 1 year; **c** stage I melanoma patients followed up for 2 years; **d** stage II melanoma patients followed up for 2 years. *AJCC* American Joint Committee on Cancer, *Expected* indicates the number of follow-up visits corresponding to the 2008 Australian and New Zealand guideline recommendations

A cross-sectional study in The Netherlands compared the frequency of melanoma follow-up with that of 2005 Dutch guidelines, considering patient perspectives and satisfaction.[12] Their guidelines recommended that melanoma patients with a Breslow thickness $\leq$1 mm return only once for follow-up shortly after treatment, while those with a Breslow thickness >1 mm attend for 13 follow-up sessions within 5 years after diagnosis. The study found that 80 % of patients with thin melanoma reported having more follow-up than recommended by the Dutch guidelines, while only 36 % of patients with thick melanomas visiting their physician more frequently. The higher proportion of patients meeting or exceeding guideline recommendations for follow-up visits in that study compared with our study is likely to be due in part to differences in the respective national guidelines. While the Dutch recommended only a single follow-up visits for patients with thin melanomas, the Australian and New Zealand guidelines recommend nine visits in the first 5 years.

A qualitative study by Rychetnik and colleagues [7] showed that long-term routine follow-up of patients with AJCC stage I/II cutaneous melanoma is often in the form of shared care. Four models of shared care were described that showed patients often alternate their follow-up visits between various clinicians, e.g. surgical oncologists, dermatologists, MIA specialists, and primary care physicians. These shared-care pathways are likely to explain why many patients in our study had less follow-up at the specialist center than recommended by the guidelines. Factors that may influence the decision to undertake follow-up in part or entirely outside of the MIA include the level of risk perceived by the clinician and patient, the distance that the patient needs to travel, and time required away from work and other commitments, as well as the presence of co-existing medical conditions needing follow-up.[13]

The MIA is one of the largest melanoma treatment centers in the world and has a large, prospectively collected database from which this study sample was drawn. By using an inception cohort of patients newly diagnosed with AJCC stage I/II melanoma we have minimized bias that would otherwise result from a more selected study population. Adherence to guideline recommendations may be higher at

TABLE 3 Characteristics of melanoma patients by stage and number of follow-up visits

Characteristic	Stage I follow-up			Stage II follow-up		
	No visit	One visit	Two or more visits	No visit	One visit	Two or more visits
AJCC stage of disease						
I	566 (21.6)	565 (21.6)	1487 (56.8)	–	–	–
II	–	–	–	142 (12.6)	182 (16.1)	805 (71.3)
Subsequent event[a]						
None	420 (18.1)	513 (22.1)	1384 (59.7)	69 (8.8)	107 (13.7)	607 (77.5)
Recurrence	32 (25.2)	30 (23.6)	65 (51.2)	47 (16.8)	66 (23.6)	167 (59.6)
Second primary	114 (65.5)	22 (12.6)	38 (21.8)	26 (39.4)	9 (13.6)	31 (47.0)
Breslow thickness (mm)						
<0.75	369 (27.0)	344 (25.2)	652 (47.8)	–	–	–
≥0.75	197 (15.7)	221 (17.6)	835 (66.6)	142 (12.6)	182 (16.1)	805 (71.3)
Sex						
Female	245 (20.8)	234 (19.8)	701 (59.4)	40 (10.4)	52 (13.5)	293 (76.1)
Male	321 (22.3)	331 (23.0)	786 (54.7)	102 (13.7)	130 (17.5)	512 (68.8)
Age (years)						
<40	75 (18.9)	80 (20.2)	241 (60.9)	2 (3.3)	11 (18.3)	47 (78.3)
40–49	79 (19.1)	91 (22.0)	243 (58.8)	8 (8.8)	14 (15.4)	69 (75.8)
50–59	138 (23.2)	129 (21.7)	327 (55.1)	19 (10.3)	30 (16.3)	135 (73.4)
60–69	149 (23.6)	130 (20.6)	353 (55.9)	35 (12.6)	39 (14.1)	203 (73.3)
70–79	79 (21.0)	89 (23.6)	209 (55.4)	37 (13.7)	43 (15.9)	190 (70.4)
≥80	46 (22.3)	46 (22.3)	114 (55.3)	41 (16.6)	45 (18.2)	161 (65.2)
Year diagnosed						
2008	122 (19.4)	116 (18.5)	390 (62.1)	33 (13.0)	47 (18.5)	174 (68.5)
2009	140 (20.5)	156 (22.9)	386 (56.6)	24 (8.9)	46 (17.0)	200 (74.1)
2010	157 (24.1)	140 (21.5)	355 (54.5)	40 (13.1)	49 (16.1)	216 (70.8)
2011	147 (22.4)	153 (23.3)	356 (54.3)	45 (15.0)	40 (13.3)	215 (71.7)

Data are expressed as *n* (%)

Percentages shown in this table are row percent

AJCC American Joint Committee on Cancer

[a] The subsequent event is a recurrence or new primary disease. It is defined as 'none' if there were no subsequent events across the follow-up time, 'recurrence' if their first subsequent event was a recurrence, and 'second primary' if their first subsequent event was a new primary

TABLE 4 All 3747 patients diagnosed with melanoma

	Stage I	Stage II
No follow-up record	566 (21.6)	142 (12.6)
One follow-up record	565 (21.6)	182 (16.1)
Two or more follow-up records		
Ongoing follow-up[a]	931 (35.6)	553 (49.0)
No record in the last 18 months	556 (21.2)	252 (22.3)
Total	2618 (100)	1129 (100)

Data are expressed as *n* (%)

[a] Follow-up records in the last 18 months (January 2012–June 2013)

the MIA than in many other clinical settings that are not as large, well-funded, or specialized to treat melanoma. Whilst the Australian guidelines suggest a particular follow-up frequency, in practice clinicians will suggest follow-up that takes into account the patients' anxiety, perceived ability to undertake skin self-examination, and distance from the patients' home to the specialist center.[14,15]

Our study was limited to a single specialist center (MIA) and we therefore only captured follow-up visits to an MIA clinician. It is unknown how many patients returned to their referring doctor for regular skin checks or the number

TABLE 5 Number of follow-up visits in the specified years for patients with stage I and II melanoma

Records	No. of stage I patients followed up for:				No. of stage II patients followed up for:			
	1 year	2 years	3 years	4 years	1 year	2 years	3 years	4 years
No recorded visits	686 (26.2)	452 (23.0)	271 (20.7)	125 (19.9)	187 (16.6)	111 (13.4)	62 (11.8)	34 (13.4)
1	832 (31.8)	456 (23.2)	291 (22.2)	125 (19.9)	257 (22.8)	160 (19.3)	105 (20.0)	48 (18.9)
2	**648 (24.8)**	297 (15.1)	183 (14.0)	81 (12.9)	278 (24.6)	101 (12.2)	63 (12.0)	28 (11.0)
3	**297 (11.3)**	259 (13.2)	130 (9.9)	56 (8.9)	239 (21.2)	110 (13.3)	58 (11.1)	31 (12.2)
4	93 (3.6)	**225 (11.5)**	101 (7.7)	48 (7.6)	**106 (9.4)**	112 (13.5)	40 (7.6)	15 (5.9)
5	40 (1.5)	**147 (7.5)**	107 (8.2)	33 (5.3)	**32 (2.8)**	109 (13.2)	44 (8.4)	14 (5.9)
6	13 (0.5)	68 (3.5)	**93 (7.1)**	43 (6.9)	19 (1.7)	61 (7.4)	55 (10.5)	16 (6.3)
7	5 (0.2)	32 (1.6)	**69 (5.3)**	43 (6.9)	11 (1.0)	33 (4.0)	23 (4.4)	18 (7.1)
8	3 (0.1)	12 (0.6)	25 (1.9)	**31 (4.9)**	–	**14 (1.7)**	36 (6.9)	14 (5.5)
9	1 (0.04)	6 (0.3)	22 (1.7)	**21 (3.3)**	–	**9 (1.1)**	14 (2.7)	10 (3.9)
10	–	3 (0.2)	10 (0.8)	10 (1.6)	–	6 (0.7)	15 (2.9)	8 (3.2)
11	–	3 (0.2)	2 (0.2)	9 (1.4)	–	3 (0.4)	5 (1.0)	8 (3.2)
12	–	–	1 (0.1)	1 (0.2)	–	–	**2 (0.4)**	4 (1.6)
13	–	1 (0.1)	2 (0.2)	–	–	–	–	6 (2.4)
14	–	1 (0.1)	2 (0.2)	2 (0.3)	–	–	2 (0.4)	–
15	–	–	–	–	–	–	–	–
16	–	–	1 (0.1)	–	–	–	–	**–**
Total	2618 (100)	1962 (100)	1310 (100)	628 (100)	1129 (100)	829 (100)	524 (100)	254 (100)
Expected no. of visits	2 or 3	4 or 5	6 or 7	8 or 9	4 or 5	8 or 9	12 or 13	16 or 17

Data are expressed as *n* (%)

Bold values indicate the number of records that corresponds to visits recommended by the 2008 Australian and New Zealand guideline

TABLE 6 All 3747 patients diagnosed with melanoma

	Stage I	Stage II
No follow-up record	566 (21.6)	142 (12.6)
One follow-up record	565 (21.6)	182 (16.1)
Two or more follow-up records		
Ongoing follow-up[a]	931 (35.6)	553 (49.0)
No record in the last 18 months	556 (21.2)	252 (22.3)
Total	2618 (100)	1129 (100)

Data are expressed as *n* (%)

[a] Follow-up records in the last 18 months (January 2012–June 2013)

that simply chose not to attend for any follow-up after their initial diagnosis. The routinely collected information in the database does not distinguish between patient records for scheduled follow-up visits or unscheduled visits, pathology results, and other sources of patient information.

CONCLUSIONS

For patients with early-stage melanoma, the number of MIA follow-up visits was highly variable, and generally there were fewer visits per patient than recommended by current national clinical guidelines. This suggests that many patients were followed up outside the specialist center, followed up within a shared-care framework, or not followed up at all. Further studies are required to ascertain how patients are being followed-up outside the specialist center, how frequently patients are followed-up, which clinicians provide that follow-up, and whether a decreased frequency of follow-up impacts on patient outcomes. This will allow the development of an optimal evidence-based strategy for follow-up of patients with AJCC stage I/II melanoma.

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APPENDIX

Routinely collected records at MIA are a combination of various consultations and do not distinguish routine follow-

up visits from other types of records such as test results or updates to patient records from other sources. It is likely that a single follow-up visit may result in a number of follow-up records. To assess the impact of this we conducted a sensitivity analysis where we assumed that consecutive records that each fall less than 15 days apart were related to one follow-up visit. These records were then grouped together as one visit and the mean date was used as the date for that visit, with 15.2 % of patients and 9.3 % of all records having been grouped in this process. The largest number of records that were grouped together was 11 records, with 67 days between the first and last record in the group. Tables 5 and 6 are based on these grouped records of follow-up. There is little difference in interpretation between these tables and those presented in the main paper.

REFERENCES

1. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. *Int J Cancer*. 2010;127(12):2893–2917.
2. Erdmann F, Lortet-Tieulent J, Schuz J, et al. International trends in the incidence of malignant melanoma 1953-2008: are recent generations at higher or lower risk? *Int J Cancer*. 2013;132(2):385–400.
3. Australian Institute of Health and Welfare & Australasian Association of Cancer Registries. Cancer in Australia: an overview, 2012. Cancer series no. 74. Cat. no. CAN 70 2012. Available at: http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129542353. Accessed 27 March 2014.
4. Francken AB, Shaw HM, Accortt NA, Soong SJ, Hoekstra HJ, Thompson JF. Detection of first relapse in cutaneous melanoma patients: implications for the formulation of evidence-based follow-up guidelines. *Ann Surg Oncol.* 2007;14(6):1924–1933.
5. Francken AB, Bastiaannet E, Hoekstra HJ. Follow-up in patients with localised primary cutaneous melanoma. *Lancet Oncol.* 2005;6(8):608–621.
6. Turner RM, Bell KJL, Morton RL, et al. Optimizing the frequency of follow-up visits for patients treated for localized primary cutaneous melanoma. *J Clin Oncol*. 2011;29(35):4641–4646.
7. Rychetnik L, Morton RL, McCaffery K, Thompson JF, Menzies SW, Irwig L. Shared care in the follow-up of early-stage melanoma: a qualitative study of Australian melanoma clinicians' perspectives and models of care. *BMC Health Serv Res.* 2012;12:468.
8. Balch CM, Gershenwald JE, Soong SJ, et al. Final version of 2009 AJCC melanoma staging and classification. *J Clin Oncol*. 2009;27(36):6199–6206.
9. Australian National Health and Medical Research Council. Clinical practice guidelines for the management of melanoma in Australia and New Zealand. 2008. Available at: http://www.nhmrc.gov.au/guidelines/publications/cp111. Accessed 19 March 2014.
10. Francken AB, Accortt NA, Shaw HM, et al. Follow-up schedules after treatment for malignant melanoma. *Br J Surg*. 2008;95(11):1401–1407.
11. Rueth NM, Xing Y, Chiang YJ, et al. Is surveillance imaging effective for detecting surgically treatable recurrences in patients with melanoma? A comparative analysis of stage-specific surveillance strategies. *Ann Surg*. 2014;259(6):1215–1222.
12. Holterhues C, van de Poll-Franse LV, de Vries E, Neumann HA, Nijsten TE. Melanoma patients receive more follow-up care than current guideline recommendations: a study of 546 patients from the general Dutch population. *J Eur Acad Dermatol Venereol*. 2012;26(11):1389–1395.
13. Morton RL, Rychetnik L, McCaffery K, Thompson JF, Irwig L. Patients' perspectives of long-term follow-up for localised cutaneous melanoma. *Eur J Surg Oncol*. 2013;39(3):297–303.
14. Rychetnik L, McCaffery K, Morton RL, Thompson JF, Menzies SW, Irwig L. Follow-up of early stage melanoma: specialist clinician perspectives on the functions of follow-up and implications for extending follow-up intervals. *J Surg Oncol*. 2013;107(5):463–468.
15. Rychetnik L, McCaffery K, Morton R, Irwig L. Psychosocial aspects of post-treatment follow-up for stage I/II melanoma: a systematic review of the literature. *Psychooncology*. 2013;22(4):721–736.