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Variability in melanoma post-treatment surveillance practices by country and physician specialty: A systematic review

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Abstract

Background—There are no evidence-based guidelines for surveillance of patients with melanoma following surgical treatment. We performed a systematic review to identify current stage-specific surveillance practices for patients with melanoma by country and physician specialty.

Methods—Three major medical indices, MEDLINE, the Cochrane Library database, and Scopus, were reviewed to identify articles published in January 1970 to October 2011 that included detailed information about surveillance of patients with melanoma after initial surgical treatment. Data on surveillance intervals and recommended evaluation were extracted and categorized by country and, when reported, physician specialty.

Results—One hundred four articles from 10 countries and 4 physician specialties (dermatology, surgical oncology, medical oncology, and general practice) met the inclusion criteria, including 43 providing specific patient-level data. The articles showed wide variation with respect to surveillance intervals and recommended evaluations. Variation was greatest for patients with stage I disease, for whom follow-up frequency ranged from 1 to 6 visits per year during years 1 and 2 after treatment. All 4 physician specialties agreed that for years 1–3, the follow-up frequency should be 4 times per year for all patients. For years 4 and 5, surgical oncologists recommended 2 follow-up visits per year, whereas general practitioners, dermatologists, and medical oncologists recommended 4 visits per year. Recommended imaging and laboratory evaluations were most intense in the United Kingdom and most minimalist in The Netherlands. While general practitioners did not recommend routine laboratory or imaging tests for surveillance, all other specialties utilized both in their surveillance practice. Self skin-examination was recommended for surveillance in all countries and by all practitioner specialties.

Conclusions—There is significant intercountry and interspecialty variation in surveillance of patients with melanoma. As the number of melanoma survivors increases, it will be critical to examine the benefits and costs of various follow-up strategies to establish consensus guidelines for melanoma post-treatment surveillance.

Keywords

melanoma; post-treatment surveillance; patient care; systematic review

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Introduction

Globally, melanoma is estimated to affect 200,000 people annually, and the highest incidence is reported in Australia [1]. With a median age of onset of 60 years, melanoma affects young and middle-aged adults disproportionately compared to other solid tumors [2]. When population-based mortality indicators, such as years of life lost, are considered as a measure of the impact of a disease on society, melanoma is among the top four malignancies in the US [3].

More than 90% of primary melanomas are diagnosed prior to evidence of distant metastasis and are potentially curable with adequate surgical treatment [4]. In the 2009 American Joint Committee on Cancer (AJCC) staging system for melanoma, 5-year survival was reported to be 95% for patients with stage I disease, 68% for stage II disease, and ranged from 80% to 42% for stages IIIA to IIIC, respectively [5]. Early detection of recurrent melanoma when it is amenable to treatment is important because it is believed to result in improved overall survival outcomes. Approximately 50% of all first recurrences are in the regional lymph nodes, 20% are local/regional recurrences which include satellite and in-transit metastases, and 30% are at distant sites [6–9]. For all patients with melanoma, the risk of first recurrence is highest during the first 2 to 4 years after excision, but a small risk of death from recurrence persists even after 10 years [10–13]. In addition, an estimated 1% to 8% of patients eventually develop a second primary melanoma [14–20].

It has been reported that patients often detect their own recurrences, which calls into question the need for physician-directed surveillance and routine diagnostic imaging [21, 22]. However, one of the few prospective follow-up studies, by Garbe et al. [23] showed that imaging, particularly sonography of the regional lymph nodes, detected a significant proportion of early recurrences in patients with stage I and II melanoma.

The increasing number of melanoma survivors and the increasing costs of healthcare mandate the development of practice guidelines for surveillance of patients with melanoma [22, 24–27]. We systematically examined the current body of literature and consensus guidelines to determine the variation in clinical practice patterns with respect to stage-specific surveillance of melanoma patients by country and physician specialty.

Methods

The SCOPUS, PubMed, and Cochrane Library databases were searched for articles published between January 1970 and October 2011 on surveillance of patients with melanoma. Search terms were “post-treatment melanoma surveillance”; “melanoma follow-up”; “evidence-based follow-up” + “melanoma”; “evidence-based melanoma surveillance”; “melanoma” + “outcomes”; “outcomes” + “melanoma” + “evidence-based follow-up”; and “outcomes” + “melanoma” + “surveillance”. A total of 8315 articles were initially identified (Figure 1). Articles were imported into Endnote X2.0 (Build 3210, Thomson Corporation, Stamford, CT), and duplicate entries were identified and deleted (n=1054 articles).

In the second phase of the review, abstracts were reviewed for inclusion and exclusion criteria. Articles were excluded if they pertained only to patients with stage IV disease (n=598) or patients receiving palliative or hospice care (n=737); were not available in English translation (n=16); or reported the primary outcomes of a clinical trial based on treatment (n=1090). The remaining 4820 articles were examined to determine whether the primary focus was related to melanoma surveillance; articles that focused on staging (n=4307), short-term postoperative follow-up (n=83), or follow-up during systemic therapy (n=326) were also excluded. The remaining 104 articles were included in this review. Forty-four of the 104 articles reported patient-level observations. The other 60 articles reported

surveillance practices but did not include patient-level data; these articles included reviews, expert opinion articles, and articles presenting specific recommendations related to particular imaging or laboratory evaluations.

Specific recommendations related to surveillance interval and surveillance examinations were extracted from each article and stratified according to country of origin and, when reported, physician specialty. Country of origin was defined as the location of the corresponding author at the time of publication. In addition, a subset analysis was performed of articles that had as their primary focus a comparison of surveillance practices among physician specialties.

Bandolier's evidence-based evaluation system for systematic reviews was used to assign the level of evidence for each article [28] (Table 1). Each article was independently categorized and scored by 2 authors (K.D.C. and J.N.C.). Quality score discrepancies were resolved by consultation between these 2 authors.

Results

Studies reporting patient-level data

A total of 43 articles from 11 countries (Australia, Belgium, Canada, Denmark, England, France, Germany, Korea, The Netherlands, Switzerland, and the United States) and 4 physician specialties (primary care, dermatology, medical oncology, and surgical oncology), reported patient-level data for surveillance of patients with invasive melanoma (Table 2). Since only 1 article included patients with melanoma in situ, these patients were included in this summary [29]. In these 43 articles, a total of 150,829 patients were followed from 6 months to 36 years. The majority of the studies (n=34) were retrospective; 4 were prospective nonrandomized studies, [19, 23, 30, 31] 3 were cross-sectional interview or survey studies; [32–34] and 1 was a systematic review [35]. One article reported surveillance recommendations based on a randomized trial, which was performed with the primary objective of comparing the efficacy of immediate discharge to general practitioners versus ongoing surveillance by an oncologist [36]. The other study was a mixed-methods study (retrospective and cross-sectional interview) [37]. Only a relatively small number of retrospective studies scrutinized the benefits of specific follow-up strategies [9, 22, 25, 27, 30, 38–40]. A single randomized, controlled trial was identified that included melanoma surveillance outcomes based on physician specialty [36].

Surveillance Practices

Surveillance recommendations varied according to disease stage, country of origin, and physician specialty. Variations were related to the frequency of examination and use of diagnostic imaging and laboratory tests. Questions were also raised for the need for any follow-up for patients with fully resected melanoma, [30, 41, 42] however, some authors noted the increased risk for second primary melanomas in patients with an initial diagnosis of cutaneous melanoma and emphasized the importance of consistent follow-up [15, 17]. The only area of consensus was the importance of self-examination in the intervals between regular follow-up appointments.

Stage-specific surveillance recommendations by country for years 1 to 5 after initial surgery are summarized in Table 3. Of note is that consensus documents did not exist for several countries and articles included in the previously reported systematic review did not include specific guidelines for follow up of stage I–III disease and are therefore not included in Table 3 [24, 43–47]. There were significant differences noted in the surveillance practices among countries (Table 3). The most significant differences were noted with respect to

surveillance intervals following the treatment of stage I disease: the recommended frequency of visits ranged from 1 to 6 visits per year during the first 2 years after treatment. In a recent update of surveillance guidelines from Switzerland (2011), [48] clinical examination 2 times per year was recommended for patients with stage I disease, whereas previously 4 visits per year had been recommended [48, 49]. For patients with all stages of disease, the United Kingdom had the most intensive recommendations for imaging and laboratory evaluations, while The Netherlands had the most minimalist approach to testing (Table 3). The United Kingdom was the only country to recommend ongoing medical photography throughout the course of care. The Netherlands was the only country to recommend examination alone with no diagnostic imaging or laboratory evaluations. There was consensus across all countries regarding the need for self-examination by all patients, as well as agreement that patients with high-risk stage III disease require regular clinical examinations.

Stage-specific surveillance recommendations by physician specialty for years 1 to 5 after initial surgery are summarized in Table 4. This analysis was based on the small subset of articles (n=14) that included a comparison of surveillance practices by physician specialty. Recommendations for both surveillance intervals and diagnostic imaging and laboratory evaluations varied by specialty [26, 33, 36, 45, 50–55]. The greatest variation was seen with respect to recommended frequency of follow-up visits for patients with stage I disease, which ranged from 2 to 4 times per year. In addition to variable stage-specific recommendations, [56] one study reported a need to evaluate patients differently based on race as lower 10 year survival and higher risk of recurrence have been noted in African American melanoma patients compared to Caucasian patients presenting with similar stages of disease [57, 58].

Stage-specific recommendations regarding the frequency of follow-up visits more than 5 years after initial surgery, by country and physician specialty, are summarized in Table 5. There was general consensus among countries and specialties for annual surveillance. One exception was the United Kingdom recommendation that follow-up after 5 years be considered only on an as-needed basis.

Discussion

This systematic review highlights the significant worldwide variation in stage-specific surveillance recommendations for melanoma patients with respect to both frequency of surveillance visits and routine diagnostic imaging and laboratory evaluations during the first 5 years after treatment. Self-examination was a universal recommendation from every country [21, 34, 41, 42, 48, 49, 59–66] and by all practitioner specialties [33, 51, 52, 54, 55, 62, 67–70]. Surveillance recommendations varied the greatest for patients with stage I disease. Recommended imaging and laboratory evaluations were most intense in the United Kingdom and most minimalist in The Netherlands. While general practitioners did not recommend routine laboratory or imaging tests for surveillance, all other specialties utilized both in their surveillance practice.

A single randomized, controlled trial was identified which included melanoma surveillance outcomes based on physician specialty [36]. In this trial, the efficacy of immediate discharge to a general practitioner for continued surveillance versus continued surveillance by a physician in an outpatient hospital setting was evaluated [36]. However, this study included patients with various malignancies, including colorectal, gastric, pancreatico-biliary, head and neck, and skin cancers, as well as general surgical patients. Melanoma patients represented only a small subset of those included in the study. Patients who were randomized to receive care by general practitioners reported reduced travel time and lower associated costs as well as higher satisfaction. The authors found that the key contribution of

immediate discharge from oncology care was the ability for oncologists to have more time to dedicate to new patients. The investigators concluded from their study that while surveillance in the general practice setting may be effective for some patients with low-stage, completely resected disease, those with more advanced disease undergoing more extensive surgical treatments were better served by ongoing surveillance in the clinical oncology setting.

Since the completion of the systematic review, an important article by Turner et al has been published examining the frequency of follow-up for melanoma patients. [71]. The objective of the study was to develop evidence-based guidelines for stage I and II patients. Based on a cohort of 3,081 melanoma patients, 229 of every 1000 patients were observed to have recurrent melanoma and 61 developed a new primary in 10 years. Using these results to model the delay in diagnosis based on two different surveillance schedules, it was noted that there was only minimal delay in diagnosis of recurrence associated with a reduced follow-up schedule of 2 visits per year for 2 years followed by annual visits for years 3 through 10 compared to 2 visits per year for 5 years followed by annual visits [71]. The study concluded that the minimal delay in diagnosis of recurrence may not warrant the expense of added follow up visits.

These findings are consistent with those of a previous review of melanoma surveillance guidelines published in 2010 by Leiter et al. [31] in which the authors reported that surveillance remains a controversial issue despite consensus on melanoma surgical treatment. Leiter et al [72] reported that the follow-up frequency for melanoma patients ranged from annually to every 3 months for a minimum of 5 years. In another report by Francken et al [35], the authors noted that only clinical examination and medical history are cost effective tools for detection of recurrences. An additional systematic review which evaluated country specific differences did not make any conclusive findings and limited country inclusion to the US, Australia/New Zealand and Germany [73]. With respect to surveillance imaging, lymph node sonography has been noted to be promising modality for the early detection of regional nodal recurrence, however survival benefits have not been demonstrated [46, 47, 74, 75]. However, the results of sonography have been shown to be highly operator dependent indicating that there may be significant variability in sensitivity when widely adopted in clinical practice.

In an attempt to provide data to inform future surveillance guidelines, our group previously reported the stage-specific conditional survival outcomes in melanoma patients [11, 12]. Conditional survival represents the probability that a cancer patient will survive an additional year given that he or she has already survived a given number of years. Using the nationwide Surveillance, Epidemiology, and End Results database, we calculated conditional survival for patients with stage I, II, III, and IV melanoma. Conditional survival was relatively stable over time for stage I patients, at 97%, but for patients with more advanced disease, conditional survival was lower at the time of diagnosis and improved over time (Table 6). [12] For example, at the time of diagnosis, a patient presenting with stage IV melanoma was estimated to have a 5-year disease-free survival of only 19%; however, for patients with stage IV disease who survived to 5 years, conditional survival for the following year was estimated to be 84%. A separate analysis of conditional survival outcomes for patients with substages of stage III melanoma patients was also performed using our institutional melanoma database [11]. In this analysis, there was also a notable increase in conditional survival over time for these patients, which supports recommendations for increasing the surveillance interval, particularly beyond year 3, when the number of recurrences decreases over time.

In addition to the limitation that the majority of the studies in this systematic review were retrospective, many of the studies reported short follow-up times, and several studies that evaluated recurrences in patients beyond 5 years did not specify whether the patients were being examined at regular follow-up intervals or chose to return to surveillance because of a symptom or new lesion [13, 76]. Another consideration is that the majority of the studies were performed in the 1990s, prior to the wide-spread adoption of sentinel lymph node biopsy for the pathologic staging of regional lymph nodes and prior to the availability of contemporary diagnostic imaging. As a result of stage migration related to both sentinel lymph node biopsy and improved imaging, contemporary patients with stage II disease who are documented to be free of micrometastatic nodal disease are known to have more favorable outcomes than previously reported and may be more appropriately followed at less frequent intervals or with less testing. While there is an increasing prevalence of melanoma in-situ, surveillance practices for these patients have not been adequately addressed and are not included in the current review. In a recent population-based, Mocellin et al noted that while patients with melanoma in-situ have overall relative survival equal to the general population, ongoing surveillance is recommended because these patients are known to be more likely to develop additional primary melanomas [77]. Publication bias should be considered in the context of all systematic reviews; it is possible that studies linking surveillance to poorer outcomes are less likely to be reported in the literature.

A number of studies reported on surveillance strategies and their associated costs [24, 74, 78–82]. Although cost should not be the primary consideration in the development of surveillance recommendations, they should be considered. However, it is challenging to make international comparisons given the differing health care systems and how these systems may influence decisions about whether a physician visit or test should be part of routine screening. It is evident that the majority of patients with melanoma recurrence are either self-detected or detected during clinical examination, which calls into question the need for routine imaging and laboratory assessment [23, 24, 41, 64, 83, 84]. Furthermore, the use of specific imaging tests have been scrutinized and it has been reported that many diagnostic imaging examinations are not beneficial in detecting early melanoma recurrence [82, 85]. The impact of frequent, intensive follow up screening on quality of life should also be considered as it has been documented that increased screening can result in patient reported stress and anxiety [55, 86, 87].

In a cost comparison study of various surveillance strategies, Leiter et al. reported that the estimated cost to detect 1 recurrence in a patient with stage I melanoma was \$38,574 (€13,388) because the majority of patients who complete lifelong follow-up for stage I melanoma do not have a recurrence [74]. Given the high cost and low rate of detection of recurrence, particularly in patients with early disease, the authors suggested that surveillance should be tailored or risk-adapted to reduce costs in patients with stage I disease while increasing surveillance with imaging and related expenditures in patients with higher-risk, stage III disease [60]. Such an approach would increase the detection of early treatable recurrences in higher-risk patients [74]. An additional study that examined the cost-effectiveness of surveillance noted that routine lymph node sonography detected an additional 17% (stage I) and 22% (stage II) of early recurrences, which at a cost of approximately \$187 per evaluation resulted in a total cost per metastasis detected of \$10,942 for stage I disease, \$5,804 for stage II disease, and \$4,364 for stage III disease [81]. While it is not advocated that costs be the primary consideration in the surveillance of cancer patients, costly tests should be evaluated prior to their adoption, and those with excellent positive predictive values may provide the best value [85].

Despite the prevalence of melanoma survivors and the demonstrated benefit of detection of early recurrences, [6, 23] there continues to be a lack of universal guidelines for stage-

specific surveillance of melanoma patients. Randomized trials of more intensive versus less intensive follow-up are difficult to conduct and require long-term follow-up, which is expensive. As a result, clinical practice is based primarily on retrospective reviews and traditional practices resulting in wide variation [35, 56, 88, 89]. Currently, there is little evidence documenting that intensive surveillance practices are associated with increased survival. To establish evidence based guidelines, prospective randomized control trials or stage-specific decision models are needed which evaluate patients from the point of designation as disease free throughout the course of their life.

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Figure 1.
Summary of search parameters

Table 1

Assessment Criteria for Level of Evidence

Ranking	Criteria
I	Strong evidence from at least one published systematic review of multiple well designed trials
II	Strong evidence from at least one published properly designed randomized controlled trial of appropriate size and clinical setting
III	Evidence from published, well designed trials without randomization, single group pre-post, cohort, time series or matched case-control studies
IV	Evidence from well-designed, non-experimental studies from more than one center or research group
V	Opinions of respected authorities based on clinical evidence, descriptive studies or reports of expert consensus committees

Adapted from [28]

Table 2

Summary of melanoma surveillance articles with patient-level data

Author	Year	Country	Type of study	Number of patients	Melanoma stage	Median duration of follow-up, years	% of patients with reported recurrences	Level of evidence
Kersey et al. [41]	1985	Canada	Retrospective	393	I-IV	3	16	III
Regan et al. [32]	1985	United Kingdom	Cross-sectional survey	78	I	16	100 ^a	III
McCarthy et al. [90]	1988	Australia	Retrospective	3171	I	9.8	28	III
Reintgen et al. [91]	1992	United States	Retrospective	4185	I-II	7	36	III
Slingluff et al. [92]	1992	United States	Retrospective	5838	NR	5	42	III
Baughan et al. [93]	1993	United Kingdom	Mixed Methods (Retrospective, cross-sectional interview)	331	I	10	20	III
Florey et al. [36]	1994	United Kingdom	Randomized controlled trial	909	NR	0.5	19 ^b	II
Basseres et al. [24]	1995	France	Retrospective	528	I	3-5	22	III
Shumate et al. [22]	1995	United States	Retrospective	1475	I-II	NR	13	III
Weiss et al. [30]	1995	United States	Prospective	261	I-III	NR	55	IV
Moloney et al. [94]	1996	United Kingdom	Retrospective	602	I	5	4	III
Wassberg et al. [20]	1996	Sweden	Retrospective	20,354	I-IV	15	8	IV
Brobeil et al. [95]	1997	United States	Retrospective	2600	I-IV	8	4	V
Mooney et al. [59]	1997	United States	Retrospective	1004	I (0.75-1.5 mm)	20	17	III
Sylaidis et al. [40]	1997	United Kingdom	Retrospective	244	IIC-III	10	72	III
Tsao et al. [13]	1997	United States	Retrospective	2766	I-III	15	1 ^c	III
Soong et al. [7]	1998	Australia/USA	Retrospective	4568	I-IV	10	24	III
Dicker et al. [9]	1999	United Kingdom	Retrospective	1568	I	5	19	III
Poo-Hwu et al. [38]	1999	United States	Retrospective	373	I-III	5	20	III
DiFronzo et al. [16]	2001	United States	Retrospective	3310	I-II	10	3	III
Kittler et al. [96]	2001	Germany	Retrospective	513	I-III	5	4	III
Schmid-Wendtner et al. [19]	2001	Germany	Prospective	4597	I-III	7.2	6	III
Hofmann et al. [37]	2002	Germany	Retrospective	661	I-III	1.4-4.1 ^a	19	III
Meier et al. [8]	2002	United Kingdom	Retrospective	3001	I-III	5	16	III
Garbe et al. [23]	2003	Germany	Prospective	2008	I-IV	2	12	III
Ferrone et al. [14]	2005	United States	Retrospective	4484	I-IV	5	9	III

Author	Year	Country	Type of study	Number of patients	Melanoma stage	Median duration of follow-up, years	% of patients with reported recurrences	Level of evidence
Levi et al. [18]	2005	Switzerland	Retrospective	3439	NS	29	1	III
Francken et al. [35]	2005	The Netherlands	Systematic Review	32455	I-IV	NR	7	IV
Hengge et al. [81]	2007	Germany	Retrospective	526	I-III	5	11	III
Chakera et al. [44]	2008	Denmark	Retrospective	554	I-III	10-21	41	III
Einwachter-Thompson & MacKie [25]	2008	United Kingdom	Retrospective	430	I	5	4	III
Francken et al. [60]	2008	Australia	Retrospective	4748	I-II	3	19	I
Moore Dalal et al. [84]	2008	United States	Retrospective	1062	I-II	NR	19	III
Meyers et al. [70]	2009	United States	Retrospective	118	II-III	2	36	III
Murchie et al. [52]	2009	Australia	Cross-sectional interview	18	I-III	NR	NR	III
Brown et al. [97]	2010	United States	Retrospective	1235	I-IV (1.0 mm)	6.1	16	V
Leiter et al. [31]	2010	Germany	Prospective	1969	I-III	10	6	III
Roh et al. [43]	2010	Korea	Retrospective	40	I-IV	NR	28	III
Abbott et al. [98]	2011	United Kingdom	Retrospective	34	III	1-2	36	III
DeRose et al. [79]	2011	United States	Retrospective	210	IIB-IIIIC	3	42	III
Hull et al. [34]	2011	Canada	Cross-sectional interview	143	I-IV	NR	20	III
Moore-Olufemi et al. [99]	2011	United States	Retrospective	82	I-III	10	19	IV
Leiter et al. [100]	2011	Germany	Retrospective	33,384	I-IV	4	22	III

NR, not reported;

^a Patients included only if they had a recurrence.

^b Recurrences reported for all surgical cases (nonmelanoma included).

^c Only recurrences that were detected more than 10 years after initial treatment were reported

Table 3

Stage-specific surveillance guidelines by country during years 1 to 5

	Australia/New Zealand [60, 61, 101]	Canada [41]	Germany [62, 64, 69, 102]	United Kingdom [8, 103, 104]	United States [105–109]	The Netherlands [35, 42, 65, 66]	Switzerland [48, 49]
<i>Number of visits per year</i>							
Stage I							
Years 1–2	1–2	2–4	3–4	2–6	1–3	3–4	2
Year 3	1–2	2–4	3–4	2–3	1–3	3–4	2
Years 4–5	1–2	2–4	2	1–2	1–3	4–5	1–2
Stage II							
Years 1–2	1–4	4	2–4	4	2–4	3	2–4
Year 3	1–4	4	2–4	2	1–4	3	2–4
Years 4–5	1–4	2	2–4	2	1–4	2	2–3
Stage III							
Years 1–2	2–4	4	2–4	4	2–4	4	4
Year 3	2–4	4	2–4	2	1–4	4	4
Years 4–5	2–4	2	2–4	2	1–4	4	2
Self-examination	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Recommended evaluations</i>							
<i>Routine diagnostic imaging</i>							
Stage I	Sonography of regional nodal basin	No	Sonography of regional nodal basin	Photography, abdominal sonography, chest radiography	Chest x-ray	No	Chest x-ray, sonography of regional nodal basin
Stage II	Sonography of regional nodal basin	Chest radiography, bone and liver-spleen scan	Chest x-ray, CT/MRI, and PET	Photography, abdominal sonography, chest radiography	Chest x-ray, CT of chest, abdomen and pelvis	No	Sonography of regional nodal basin, PET or CT
Stage III	Sonography of regional nodal basin	Chest x-ray, bone and liver-spleen scan	Chest radiography y, CT/MRI, PET	Clinical photography, abdominal sonography, chest radiography	PET/CT	No	Sonography of regional nodal basin, PET or CT
Symptom-initiated					Chest radiography, PET, CT, MRI, PET-CT		Abdominal sonography, CT, MRI, PET-CT (for non-stage III)

	Australia/New Zealand [60, 61, 101]	Canada [41]	Germany [62, 64, 69, 102]	United Kingdom [8, 103, 104]	United States [105–109]	The Netherlands [35, 42, 65, 66]	Switzerland [48, 49]
Laboratory assessment	No	CBC, liver function test	S100 serum protein (stage 2)	CBC, liver function, creatinine, lactate dehydrogenase	No	No	S-100 serum protein (stage II)

CBC, complete blood cell count; CT, computed tomography; MRI, magnetic resonance imaging; PET, positron emission tomography.

Table 4

Stage-specific surveillance guidelines by physician specialty during years 1 to 5

	General practitioner [33, 36, 51–55]	Dermatologist [62, 67, 68]	Medical oncologist [67, 69]	Surgical oncologist [65, 70]
<i>Number of visits per year</i>				
Stage I	4	2	2	NA
Stage II				
Years 1–2	4	4	4	4
Year 3	4	4	4	4
Years 4–5	4	4	4	2
Stage III	4	4	4	4 (years 1–3) 2 (years 4–5)
<i>Recommended evaluations</i>				
Self-examination	Yes	Yes	Yes	Yes
Routine diagnostic imaging	No	CT for stage III	Sonography of regional lymph nodes	CT of chest, abdomen, and pelvis
Laboratory assessment	No	LDH, AP, protein S-100 β	LDH, AP	CBC, LDH (>Stage II)

CT, computed tomography; NA, not available, LDH: lactate dehydrogenase, AP: alkaline phosphatase

Table 5

Stage-specific recommendations for number of surveillance visits per year after year 5

	Stage		
	I	II	III
<i>By country</i>			
Australia/New Zealand [60, 61, 101]	1	1	1
Canada [41]	1	1	1
Germany [62–64, 69, 102]	1–2	1–2	2
United Kingdom [8, 103, 104]	As needed	As needed	As needed
United States [105, 106]	1	1	1
Switzerland [49]	1	1	1
The Netherlands [35, 42, 65, 66]	1	1	1
<i>By physician specialty</i>			
Dermatologist [62, 67, 68]	1	1–2	2
General practitioner [33, 36, 51–55]	1	1	1
Medical oncologist [67, 69]	1–2	1–2	2
Surgical oncologist [65, 70]	1	1	1

Table 6

Conditional probability of surviving an additional year given current survival status by stage at diagnosis of melanoma (%)

Time point	Stage ^a				Substage of stage III ^b		
	I	II	III	III A	III B	III C	
Diagnosis (time 0)	97	72	51	78	54	39	
At year 1	96	72	58	77	57	50	
At year 2	97	76	67	79	66	58	
At year 3	97	80	76	85	73	67	
At year 4	97	83	84	90	79	75	
At year 5	98	86	87	90	79	78	

^a Adapted from Xing et al. [12]

^b Adapted from Bowles et al. [11]