International Models of Melanoma Management (Australia)

10

Paul Elmslie

The Clinical Management of Skin Cancer

The phrase, "clinical management," refers to the process that occurs once a suspicious lesion is found or identified by a family physician or general practitioner (GP). Typically, once this lesion is identified, the patient is referred to a dermatologist in order to obtain a tissue diagnosis. If it is determined that the lesion is a melanoma, the dermatologist will then conduct an excisional biopsy and send the sample to the pathologist, who will then confirm the lesion's malignancy and the staging if it is a melanoma.

Once the skin cancer is confirmed, the dermatologist then provides the diagnosis to the patient. Depending on the severity of the case, as well as the dermatologist's experience, the patient will likely be either treated within the dermatologist's practice or referred to a surgeon. Another significant factor is the specialist's access to important resources, and this is often determined by where the patient is located. For example, in certain regional areas, there may be only a general surgeon who is available to remove the lesion, as opposed to a surgical oncologist, plastic surgeon, or dermatologist experienced with Mohs micrographic surgery.

While the clinical management of skin cancer and, more specifically, melanoma is essentially the same in every country, there are notable differences in other aspects of care as well. This section focuses specifically on those clinical management differences in Australia, the UK, and the USA.

Australia

In Australia, the clinical management of skin cancer is a combination of primary care, public and private hospitals, and specialists. The federal government's Medicare system provides patients with a rebate for clinical services delivered by GPs and specialists. Some GPs will accept the Medicare payment as full payment; therefore, the services delivered have no out-of-pocket cost for the patient. Specialists will typically charge the patients privately and then the patients can access the Medicare rebate or use their private health insurance. State governments fund public health care and provide free hospital services to local populations. However, patients are not able to select their own specialists, and waiting lists can be quite long.

The private hospital system enables patients to select a specialist and also to have access to private rooms. Approximately one-half of Australians carry private health insurance [1].

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Currently, private health insurance does not cover primary care services, and only covers specialists and private hospital admissions.

Traditional Pathways

A GP is usually the first clinician to identify a suspicious skin lesion, whether it is presented to the GP by the patient as a suspicious lesion or it is the result of a skin check. A GP may have the necessary skills to perform a punch or shave biopsy, so long as the lesion is not located on a cosmetically sensitive area. If the lesion is a suspected melanoma, an excisional biopsy would be recommended, and a GP would also likely be able to complete this task. (The management of melanomas is discussed in more detail in the following section.)

If the lesion is located on a cosmetically sensitive area, the patient can be referred to a GP who subspecializes in skin cancer. In Australia, these GPs are known as skin cancer doctors, and they are able to conduct surgical procedures of a cosmetically sensitive nature. At a lower cost, they provide quicker access to clinical services for patients who do not have private health insurance or cannot afford to pay privately for a dermatologist or plastic surgeon.

There are also two traditional GP referral options for patients with a diagnosed or suspected melanoma [2] (see Fig. 10.1):

1. Referral to a dermatologist, and then to a surgeon if malignancy is confirmed: If a case is severe, the patient will be referred to a surgical oncologist and then potentially to a radiation oncologist if more aggressive treatment is necessary, especially for an advanced melanoma.
   (a) A patient must first receive a referral from a GP to see a dermatologist. The referral lasts 12 months.
   (b) This is usually only an option for those with economic resources because treatment can range from hundreds to thousands of dollars.
2. Referral to a state-funded public hospital system: This, however, presents its own set of challenges because the hospital system is overloaded and patients could have two very different outcomes:
   (a) A patient with a melanoma is treated within 1 month because a melanoma is considered a category 1 case with a target date of 30 days for treatment.
   (b) Non-melanoma cases have a wait list of more than a year, which means the cancer progresses as a patient waits for treatment.

These options are available to those who live in cities. For Australians living in rural areas, the options tend to be more limited. A dermatologist may visit once a month, but he or she only looks at significant cases. Thus, a GP or skin cancer clinic (which is discussed next) tends to do more diagnostic and low-level management cases. There are also regional hospitals with a visiting surgeon who may perform any necessary surgeries.

Skin Cancer Clinics

Skin cancer clinics are a relatively recent development in Australian health care. These clinics began to open in the mid-1990s. They are staffed

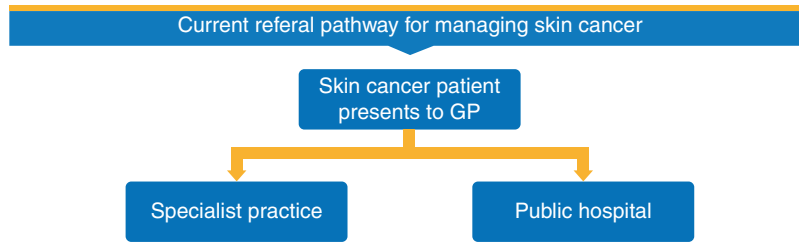

Fig. 10.1 Current referral pathway for managing skin cancer. From "Business Plan for Expansion of the National Skin Cancer Centres for the South Australian Government" (Elmslie 2016, p. 2)

by local GPs with an interest in skin cancer medicine, and they provide lower cost and quicker access to more specialized services. Clinic staff usually manages basal cell and squamous cell carcinomas (BCCs and SCCs) on a daily basis. They also have the skill set to successfully treat early-stage primary melanomas. Anything more significant (stage III, stage IV, etc.) is referred to a specialist or a hospital.

There are now 400 skin cancer clinics in operation across Australia. They are usually small—staffed by two or three doctors—and they are run by the owner/operator in partnership with his colleagues. Approximately 800 GPs work in clinics, out of a GP population of about 28,000. Today, they are considered to be a normal part of skin cancer treatment as well as a standard of care in Australia.

The clinics provide head-to-toe skin exams, on-site biopsies, and on-site treatment for most skin cancers, but patients cannot get any other type of medical services here, including prescriptions. Due to their growing popularity and their success at providing a much-needed service, more generalist GPs are beginning to integrate skin cancer services into their own practices. This is because GPs are becoming frustrated that their patients will see them for normal health concerns but then go to a GP-led skin cancer clinic for their skin cancer concerns.

Challenges in Clinical Management

There are two significant challenges facing the clinical management of skin cancer in Australia.

First, Australia has the highest rate of skin cancer in the world. In fact, every two of three Australians who live to age 70 will get skin cancer [3], and in a population of 23 million more than 750,000 skin cancers are treated every year [4]. Skin cancer is the most costly form of cancer to treat in Australia, with its annual cost to the government of $703 million in 2015 [5]. Approximately 80% of cancers are skin cancers [4].

Second, Australia is a large country with a geographically dispersed population. This makes the delivery of health services challenging, especially in regard to specialist services. Of particular concern to the management of skin cancer is the acute shortage of dermatologists. There are approximately 450 dermatologists to cover the entire population, and while most of these specialists live in the capital cities one-third of Australians live in rural areas. It is not uncommon for a dermatologist to have a 6-month wait list.

Managing Melanoma

Australia's management of melanoma is discussed at length in Section "Efficient/Effective Methods of Diagnosis and Treatment Based on the Australian Model."

United Kingdom

Current clinical management in the UK is part of a single-payer system that is publicly funded. It is unique in that the government funds it in its entirety, regardless of whether it is at a primary care or specialist level. As a result, patients have only the option of being seen at the local hospital for definitive diagnosis and treatment of skin cancer. This does not mean, however, that there are no specialists in private practice. There are a small percentage of specialists who operate within the public sphere. However, this option is typically only available for a wealthy minority who carry private health insurance.

A 2015 study conducted by Public Health England found that the number of melanoma diagnoses for patients living in the most deprived areas, who present either through the 2-week referral or GP referral, is substantially higher than that for those who live in the least deprived areas [6]. The same study found a 2% difference in emergency-room melanoma presentations between those who lived in the most deprived areas versus those living in the least deprived areas [6]. In addition, the 1-year survival rate for melanoma was noticeably lower in patients living in the most deprived areas (95%) versus those living in the least deprived areas (97%) [6].

Overview

When a patient presents to a GP with a suspicious lesion, he is automatically referred to a specialist. This is because of the NICE Guidelines, which effectively prohibit a GP from managing any lesion that is anything more severe than a superficial BCC. Therefore, if a GP finds a suspicious skin lesion, it is always referred into the hospital system.

Depending on the severity of the case, a patient will be seen by a dermatologist, who will make a diagnosis that is confirmed by a histopathologist. Then, the case will be handed over to the hospital surgeons. The severity of the lesion and its cosmetic sensitivity will determine which type of surgeon manages the patient.

Similar to Australia, the UK has also innovated its clinical delivery system to try and deal with the shortage of dermatologists, which is critical considering you are eight times more likely to die of a skin cancer in the UK compared to Australia. This is despite the fact that Australia has eight times the number of cases [7]. In fact, in the last 25 years in the UK, melanoma cases have increased faster than any of the top ten cancers in both men and women [8].

The UK has approximately 600 dermatologists for a population of 60 million people, and many regional or rural areas having little to no dermatology services in the hospitals. The development of the category called a "GP with a Special Interest" (GPwSI), however, has helped provide more dermatology services in the hospital system. These GPwSI in dermatology are required to complete a diploma-level course and undertake continuous professional development and practicing under the supervision of a dermatologist. This allows for the GPwSI to become the frontline of hospital referrals and help filter less significant cases (low-level rashes and infections). (As of this writing, the accreditation for GPwSI in dermatology was under review with the goal of establishing a national accreditation body. Updates are expected in June 2017.)

Challenges in Clinical Management

The UK hospital system divides patients into two groups in terms of waiting times to access dermatology services. Melanoma is considered a "2-week-wait" case. Once a patient is referred, it is recommended he or she be seen within 2 weeks. Many trust hospitals, however, struggle to meet this deadline despite their best efforts. All other skin cancers are placed on an 18-week waiting list. Hospitals also struggle to meet this deadline because of their workload.

Another issue for this system is that many patients with melanomas can be incorrectly referred by the GPs as 18-week-wait cases or as having benign lesions that are referred as suspected melanomas. This is due to low levels of dermoscopy use and training at a primary-care level. Results from a teledermatology study conducted in Hertfordshire, England, confirmed this. Clinical information for 110 patients revealed that 30–50% of 2-week-wait cases were not urgent [9]. This study is discussed in more detail in Section "Teledermatology and Other Educational Projects in the U.K. and its Utility in Clinical Practice."

The UK healthcare system is divided into four separate systems, each called the National Health System. (Northern Ireland's is now officially "Health and Social Care in Northern Ireland," but it is commonly still referred to as NHS.) Each country funds its own system. Though this results in many differences between each system, they are all relatively simple to navigate because general practitioners are responsible for referrals to the local hospitals.

However, like all government-funded health care, the systems are under significant cost pressures and will need to be innovated in the future in order to deal with the aging population and longer life expectancy. Additionally, in the UK, if a drug isn't approved for government funding, you can't access it through the NHS. Therefore, you would have to pay privately for the new and more expensive melanoma drugs available for advanced disease.

Managing Melanoma

In the UK, all melanomas are referred to hospital or specialists for treatment.

USA

The healthcare system in the USA is primarily private, for-profit, and, therefore, very expensive in comparison to almost all other countries. For most people, it is essential to have coverage, especially for substantial, life-threatening situations. It is not unusual for a significant health issue to have costs upwards of $100,000. People can also go bankrupt due to healthcare costs, something you don't see in Australia or the UK. As we have recently witnessed with the introduction of Obamacare in 2010, and the subsequent challenges to it, the US healthcare system is in a constant state of flux, which makes forward planning more difficult for all stakeholders.

The USA also has a Medicare/Medicaid structure to provide healthcare funding for people who meet specific criteria. Medicare is a federally funded program for people over 65 years old or for people with certain disabilities, while Medicaid is a joint state and federally funded program for people with limited income. These programs are similar to the Australian model in that each service has a CPT code associated with it that the medical practice then charges to the government. It also has the challenge that its funding will have to change in the future due to rising costs and government-deficit pressures.

Overview

Family physicians and nurse practitioners that staff primary care clinics do not typically have the skills necessary for diagnosing and treating skin cancers, including melanoma. Therefore, patients with suspected skin cancers are typically referred to a dermatologist, of which there were approximately 13,000-plus in the USA in 2015 [10].

When a patient with a suspicious skin lesion is referred to a dermatologist, a diagnosis is made and confirmed by a histopathologist. Then, the vast majority of cases are sent to a Mohs surgeon—a dermatologist who has undertaken additional training in specific surgical techniques for the treatment of skin cancer. Micrographic surgery is very common in the USA, unlike in the UK or Australia.

Mohs surgery involves the patient having the lesion removed with minimal margins. The lesion is then analyzed with frozen sections to examine the surgical margins and reviewed by the on-site Mohs surgeon for histopathological diagnosis. If the lesion was not completely excised, the Mohs surgeon will remove more tissue along the affected margin. It is especially useful for areas where margin control is important for future patient function or cosmetic purposes.

Challenges in Clinical Management

Skin cancer costs are climbing in the USA at a rate of 126%, compared to a 25% increase in the cost to treat other cancers over the same time period [11]. Treatment costs rose from $3.6 billion in the 5-year period from 2002 to 2006 to $8.1 billion in the 5-year period of 2007–2011 [11].

One reason for such an increase is because Mohs micrographic surgeries (MMS) increased by 700% between 1992 and 2009 [12]. These surgeries normally receive Medicare payments 120–370% more than a standard surgical elliptical excision. This also helps to explain why, during the same period, surgical excisions only increased by 20% [12]. In addition, 1,800 providers billed Medicare for MMS in 2009, a number that increased to 3,209 in 2012 [12]. Approximately one in four skin cancer cases are treated with MMS [12].

These rising costs are increasing awareness and concern over how skin cancers are managed and may lead to future changes, especially because many cases do not need to be managed by the hospital system, which is presently the

case. It should be noted, however, that melanomas are a slightly different situation. The vast majority of melanoma cases are managed in the hospital system, and depending on their severity this is as it should be. This will be discussed in more depth in the next section.

Another challenge facing the US management of skin cancer is the evolution of dermatology in the USA. Many dermatologists are moving more toward aesthetic and cosmetic medicine because patients pay cash on the day of their procedure. In contrast, traditional dermatology payments disbursed by an HMO—the private health insurance company—can take 90–120 days to send payments to the provider. As with Australia and the UK, it is a lengthy process to increase the number of dermatologists. Foreseeably, they will also have challenges in providing clinical services due to increased demand and the changing face of dermatology practices.

Managing Melanoma

Over the course of their lifetime, one in five Americans will develop skin cancer (Robinson 2005, cited in [13]). Each year, more than 5.4 million non-melanomas are diagnosed (Rogers 2012, cited in [13]), with more new cases of skin cancer than the combined incidence of breast, prostate, colon, and lung cancer (American Cancer Society, 2017, cited in [13]). The National Cancer Institute estimates that there will be ~87,110 new melanoma cases in the USA in 2017, and of those cases 9730 will result in death (American Cancer Society, 2017, cited in [14]). Though melanoma represents the smallest segment of skin cancer in the USA (less than 5%), it accounts for the most deaths, a rate that has been steadily increasing over the past 40 years (American Cancer Society, 2014, cited in [14]).

Studies have found that even the most experienced dermatopathologists have difficulty distinguishing between benign pigmented lesions and early melanomas. In fact, one study found that, when presented with 140 cases, a panel of dermatopathologists disagreed on 37 of them [15]. Therefore, it is recommended that when a patient presents with a suspicious lesion, it is best to receive a second opinion.

Surgical excision should be the main management tool for melanoma, particularly for cutaneous melanomas that have not spread [14]. Additional treatment is determined by the stage of progression [14]. While stage 0 melanoma requires only excision, stages I through IV could be treated with excision as well as lymph node management, which is first done through lymph node mapping and sentinel lymph node biopsy, as well as one or more of the following (depending on stage): chemotherapy, palliative local therapy, immunotherapy and/or adjuvant therapy, or signal transduction inhibitors [14].

In the USA, there are several different doctors who are trained to treat melanoma. These include dermatologists, medical oncologists, surgical oncologists, and radiation oncologists [16]. Other professionals may be part of the medical team, as well as nurse practitioners and physician assistants [16].

Before beginning treatment, a patient will go through his or her medical history with someone from the medical team [16]. This will include discussing age and health, the stage to which the melanoma has progressed, the likely outcomes of the proposed treatment plan, and the possible side effects from treatment, as well as the patient's feelings toward these side effects [16].

Patients are also advised to get a second opinion, if time allows, or participate in a clinical trial [16].

Efficient/Effective Methods of Diagnosis and Treatment Based on the Australian Model

In Australia, health practitioners have had to innovate due to a number of factors. As previously mentioned, Australia has the highest rate of skin cancer in the world. It also has a population of 23 million people who are spread across a landmass similar in size to the USA. This, coupled with a shortage of specialists who have traditionally been located in major capital cities, has led to long wait lists as well as other challenges.

The traditional model is one where the GP is the first practitioner to whom a patient with a suspected skin cancer or melanoma presents. The GP must then decide whether the patient should be referred to a dermatologist or, if the patient is unable to afford a specialist, whether he or she can be referred to the public hospital. If referred to a dermatologist in private practice, the dermatologist then makes an assessment or final diagnosis of the lesion and determines whether the lesion should be treated in his or her own practice or referred to another specialist.

In the hospital system, the admissions officer is typically the person who makes a determination based on the GP's referral as to how quickly the patient should be seen. The officer determines whether the case should be placed on the category 1 waiting list and seen within 30 days due to a suspected melanoma, or whether the case is category 3, which could put the patient on a wait list of up to 1 year.

Case Study In 2000, a 31-year-old mother of two presented to a primary care practice in Australia with a suspicious lesion of the lip. The GP recognized it as a possible skin cancer but did not have the confidence to make a definitive diagnosis. The patient did not have private health insurance and was therefore unable to afford a dermatologist or surgeon; thus, she was put into the public hospital system. She was unable to be seen in the public hospital for 9 months, and tragically the lesion was an invasive and very aggressive SCC. She died 2 months later.

This case exemplifies the importance of innovation in dealing with skin cancer, particularly in Australia. This woman sought treatment, but due to financial constraints she was unable to access the care that would have saved her life. Her case was the impetus that led to this author's development of a new Australian model of skin cancer treatment.

A New and Better Model

More often than not, the traditional model generally provides good patient outcomes, albeit with long waiting lists and easier access to those who live in major capital cities. The new model, therefore, is not dissimilar to the old model, but it does take into consideration the critical need to provide specialist services outside of the public hospital system to (1) those who may not be able to afford it and (2) those living in rural or regional areas.

Under the new model, GPs are now able to perform 60% of skin cancer diagnoses and treatment. These GPs may practice in their existing primary care practices or in skin cancer clinics. Regardless, they are able to provide a frontline service for diagnosis and treatment and, in many cases, manage low-level melanomas—in situ and level I melanomas—with a high degree of confidence. This is a shift from the situation in many other parts of the world, including the USA and the UK, where primary care physicians do not undertake this type of work. In fact, they would likely refer all suspicious lesions to their specialist colleagues.

Typically, with melanoma, as well as with other aggressive skin cancers such as SCCs, the time from initial diagnosis to treatment is critical due to the fact that some of these cancers can be very aggressive with a high level of morbidity or mortality if left too long without treatment. Therefore, the "ideal model," which is based on the new model in Australia, is designed around providing an optimized service delivery with a focus of trying to minimize the time between initial discovery and diagnosis to definitive treatment.

The Ideal Model

First, a patient would undergo an initial screening—the head-to-toe examination that is required to adequately assess for skin cancer. Because dermatologists do not tend to have enough time to conduct head-to-toe screenings for all of their patients, this is usually done by either a GP or family physician. In the USA, a physician assistant or nurse practitioner might perform the screening. Each of these medical professionals would have training in dermoscopy as well as

skills necessary to conduct a skin assessment and diagnose suspicious lesions.

Cytologists are a future potential group of medical professionals who could conduct these screenings. The world of cytology is radically changing and it will soon have a large number of highly skilled people who could quite easily work with dermoscopy to conduct skin cancer screenings.

One of the challenges that must be overcome is the misunderstanding that skin cancers are only a result of sun exposure and therefore only occur on the face, arms, or lower legs. In fact, more than 50% of melanomas are anatomically distributed on the trunk of the body of a male and the trunk and legs of the female. Unless a patient is completely undressed, you may miss 50% of melanomas (see Fig. 10.2).

If a suspicious lesion is found, a biopsy punch or shave or an excisional biopsy must be done. In the ideal model, a family physician, GP, or nurse practitioner with the appropriate training and confidence (particularly when a lesion may be located in a cosmetically sensitive area) can perform the biopsy. Once the biopsy is completed, the biopsied segment would be sent to the dermato- or histopathologist for review and, if it is a melanoma, studied to determine its stage.

Upon reviewing the pathology report, the primary care physician must determine whether to perform a further excision (particularly if it is a melanoma) or refer the patient elsewhere. If the lesion is located in a cosmetically sensitive area or is more advanced, the patient could be referred to a dermatologist or surgeon. However, this would only be possible if the patient has private health insurance or other financial resources. If not, the primary care physician could instead send the patient to a skin cancer clinic, where, for low-level cases, there would be a lower cost and quicker access to services. Many BCC and SCC cases would be referred to these clinics, whereas being referred to a public hospital could lead to up to a year of wait time.

If, however, the patient is referred into the public hospital system, the benefit of having gone through the ideal model is that the patient goes into the hospital already with a known diagnosis.

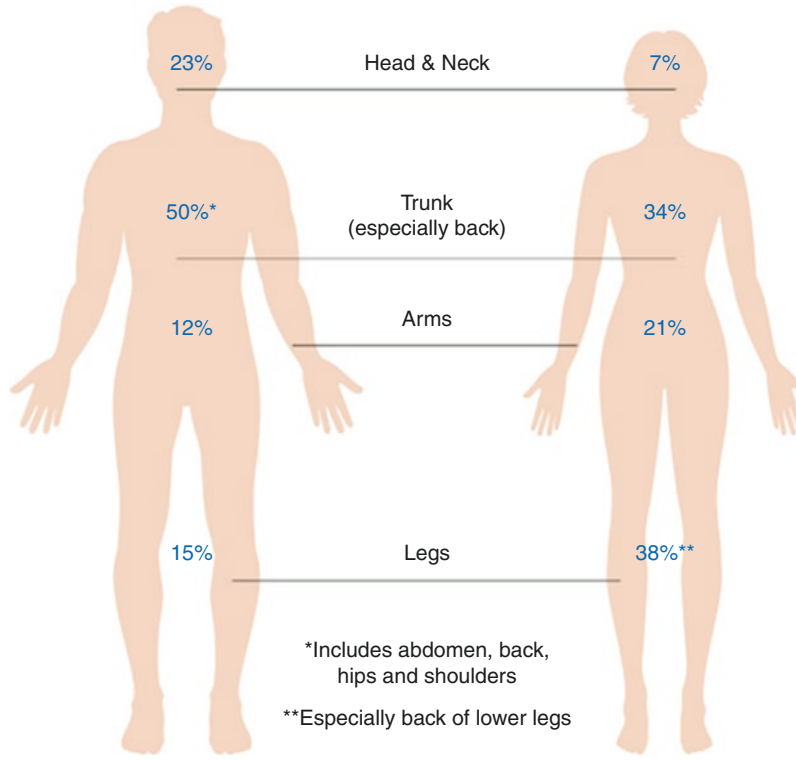

Fig. 10.2 Melanoma distribution from *Skin cancer incidence statistics, December 2015* (Cancer Research UK 2015 [24])

The hospital will know in advance that the patient needs to be seen quickly and would, therefore, provide the appropriate treatment in the required amount of time.

What You Need to Know About Australia and Its Clinicians

The ideal model is capable of providing the shortest timeframe from diagnosis to definitive treatment and, quite probably, at the lowest cost to the government, insurers, and the general public. There is still a lot of work being done, however, by primary care physicians, and this would be an adjustment for many countries. To better understand how this model works, it is important to have a more in-depth understanding of the Australian environment and culture.

Though there are registered and enrolled nurses in Australia, there are effectively no nurse practitioners or physician assistants. Furthermore, though registered and enrolled nurses are permitted to do some skin cancer screenings, the government Medicare system does not reimburse payment for any work that a nurse conducts in the screening or treatment process. As a result, nurses act more as facilitators alongside GPs to enable them to manage and treat more patients each day.

From a primary care perspective, skin cancer is reimbursed quite well. For example, in Medicare, which is the Australian Government-funded rebate system, skin cancer is the most lucrative service a GP can provide. Additionally, the GPs often take a "cowboy approach" to medical practice, meaning that they tend to take on more complex cases and push their clinical limits in comparison to other countries. This is for three reasons. First, as a culture, Australians tend to embrace a certain level of risk.

Second, there is little fear of medical or legal ramifications because it is very rare for doctors in Australia to be sued by a patient. There is an accepted understanding and recognition that doctors will not always get it right and that mistakes are an inevitable part of life. In more than 18 years of building skin cancer clinics, this author (Paul Elmslie) has worked with doctors who have treated thousands upon thousands of patients. I've not ever come across a case where a Medical legal case was brought against any doctor with whom I've worked with. I'm sure this happens occasionally; however, it is exceedingly uncommon compared to the US healthcare system.

Third, when patients have limited options, such as living in a rural or regional area, there is an expectation that the GP can perform the required treatment, to include surgery. Patients simply do not want to travel or will not be able to afford the care provided by a specialist. Regional Australians, by their very nature, are "tough" and would prefer to simply have a lesion cut out by their own doctor and continue on with their lives.

Lessons Learned from the Australian Experience

Due to the severe lack of specialists in Australia, it has become necessary to develop an alternate approach to skin cancer screenings. Skin cancer clinics, which began to form in the late 1990s, are staffed by local GPs who market to their patients that have skin cancer concerns and who don't want to wait several months to see a specialist.

Initially, several issues arose with the development of these clinics. The GPs who staffed them had no more training than their GP colleagues working in nearby primary care practices. As a result, even though these "skin cancer doctors," as they later became known, were only focusing on one element of patient care (which also happened to be the most lucrative), they had no specialized training in skin cancer management.

As a result of this sole focus on skin cancer, patients began to assume that the GPs at the skin cancer clinics were actually dermatologists or other highly trained clinicians. This became problematic because while these clinics were developing across the country, there was no standard of skill developing alongside them.

In 2005, however, discussion began on how to change that, and by 2006 Australia-based HealthCert™, in collaboration with the University of Queensland, developed the world's first certificate through to master's-level university skin

cancer program. The aim of this program was to train doctors working in these clinics on a specific skin assessment process.

Standards

The development of a minimum standard for training and care for skin cancer is critical for the success of the ideal model of skin cancer care. GPs should be trained in dermoscopy in particular; otherwise, they will be under-skilled and will ultimately miss potential melanomas. The development of specific standards in Australia remains a challenge, however. As of this writing, there are moves to try and rectify this, but ultimately colleges and the representative bodies of primary care doctors are not keen on the development of too much subspecialization for fear that it will weaken the foundation of general practice.

As a result, the UK model for GPs with special interests will likely become the model taken up in Australia, as it remains one of the best models for skin cancer management in the world.

Opportunities for Citizen Education in the USA Based on the Australian Model

In Australia, an outdoor lifestyle is very much the norm, as the vast majority of the population lives near the coast and therefore spends a lot of time at the beach. Unfortunately, but traditionally, Australians tended to forego sunscreen. As a result, national campaigns to increase awareness of the dangers of sun exposure have become critical.

The main organization fulfilling this purpose in Australia is the Cancer Council. It is a relatively well-funded national organization with its own products, such as sunscreens, and services, such as a public awareness campaign that has been ongoing for more than 20 years. The campaign is well known across the country for its "Sid the Seagull" cartoon mascot, as well as its promotional tune with the phrase, "Slip, Slop, Slap," which encourages you to slip on a shirt, slop on some sunscreen, and slap on a hat. The campaign became so popular that every Australian could sing the jingle. While targeted toward children, it actually educated the wider population about the importance of skin cancer prevention.

Though Sid the Seagull is no longer part of the campaign, his presence sparked a level of public recognition that has only increased over the years. Today, the campaign has evolved to include the words "seek" and "slide" in order to encourage people to also seek shade and slide on sunglasses.

With this campaign, the Cancer Council was able to achieve a high level of public awareness and change community attitudes toward skin cancer. This can be seen on a practical, everyday level. For example, today, in schools across Australia, there is a policy called "no hat, no play." Children are expected to wear a hat to school and are not permitted to play outside unless they are wearing one. There are places, too, where sun structures have been constructed over playgrounds and funded by government and city councils.

There are other organizations in Australia that have made inroads into public awareness. One such organization is Melanoma Patients Australia, which is a support group for people affected by melanoma. In addition to marketing their services to doctors, who in turn provide the information to their patients, they also lead public awareness activities.

The Skin Cancer Institute is a new, global, multidisciplinary organization that focuses solely on skin cancer. Its members include dermatologists, surgeons, histopathologists, primary care GPs, and nurses. The goal of the institute is to optimize limited resources—whether medical or financial, in order to minimize skin cancer's impact.

One core activity on which the Skin Cancer Institute focuses on is building education in non-traditional spaces. For example, it has recently developed programs that train professionals such as hairdressers and masseuses to be able to identify possible malignant skin lesions. This is typically done through the ABCDE rule methodology, so that they can learn how to identify a suspicious

skin lesion and communicate this to their clients to seek medical attention.

The Institute is also developing training for medical professionals. The first developed course was for pathologists on the subject of dermoscopy. The program taught pathologists the basic elements of dermoscopy and the characteristics to look for on a surface-based lesion. As photographic images will be incorporated with pathology requests in the future, this skill will be invaluable for pathologists. It will allow them to decide whether more sections will need to be cut for a biopsy if the diagnosis is inconclusive from the existing sections and if the pathologist is concerned about the lesion.

Currently, programs are in development for surgeons and podiatrists, two groups of medical professionals who are not traditionally trained in dermoscopy or skin cancer diagnosis but who are in a position to potentially diagnose suspicious lesions.

Australia's skin cancer clinics, which focus on prevention, diagnosis, and treatment as well as public awareness, are equally important educational tools. The National Skin Cancer Centres, which are a chain of skin cancer clinics, act as low-cost/quick-access referral centers in the local community. Focused on patient education, they produce a series of patient brochures that describe what a suspicious lesion might look like and how to conduct a skin self-examination (see Fig. 10.3).

These centers also lead two important community activities. Due to their focus on patient education, the clinics conduct public presentations on the prevention, self-examination, and early detection of skin cancer. The presentations are given at places such as senior citizen facilities and sporting clubs.

"Information evenings" enable professionals such as GPs, pharmacists, and even hairdressers to assist identifying suspicious skin lesions and then discussing them. This provides an opportunity for people, particularly in nonmedical fields, to learn how to identify possible melanomas. It is important for any professional to whom a person may present with a suspicious lesion to know where to refer him or her, and these "education evenings" provide that.

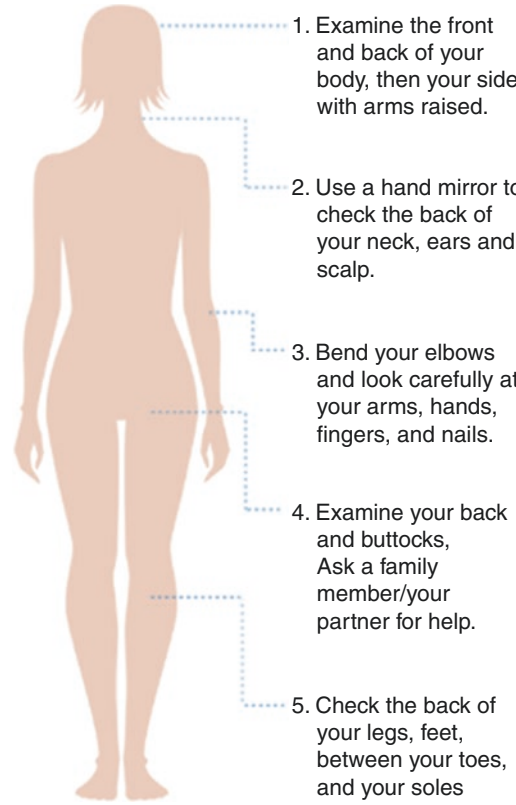

Fig. 10.3 Self-examination from *National Skin Cancer Centre Brochure* ([25] May 2016)

As shown with the Australian model, there are many different opportunities for citizen education in the USA. Organizations such as the American Cancer Society and the American Academy of Dermatologists, as well as smaller private foundations, are excellent educational resources to provide tools similar to those being successfully used across Australia.

Current Educational Efforts in Australia in Skin Cancer Management for Physicians and How These Opportunities Can Be Expanded Internationally

As most of those reading this know, primary care is typically the front line for a patient to enter the healthcare system. The primary care physician determines how the patient is man-

aged and to which medical facility he or she should be referred to.

When dealing with skin cancer patients, however, one of the challenges is that primary care physicians do not have enough training to diagnose a melanoma or successfully assess any lesion that may appear abnormal. Primary care physicians likely did not receive any dermoscopy training, which, even though it has only been introduced more widely in the last 20 years, is an essential skill in the diagnosis of skin cancer. Patients tend to visit their primary care physicians more often than a dermatologist, so training is crucial for a better diagnosis.

When skin cancer clinics began developing across Australia, it was immediately realized that primary care physicians were not adequately trained to diagnose and treat skin cancer. As a result, HealthCert™ developed a course in skin cancer medicine in 2005. Called the Certificate in Primary Care Skin Cancer Medicine, the course was built in collaboration with the University of Queensland through then-Deputy Dean David Wilkinson. With his help, it became a school award course receiving credit into the Master of Medicine (skin cancer) degree at the University's School of Medicine.

Today, the program has developed into nine separate courses in the areas of skin cancer medicine, skin cancer surgery, and dermoscopy. Participants are able to study toward the original professional certificate, an advanced certificate, or a professional diploma. The professional diploma program in general dermatology is of particular importance because many times, a patient will present to his or her primary care physician with what looks like a suspicious lesion, but is really a rash or an infection or some other type of dermatological condition. Doctors who complete the professional diploma training become more educated about the various types of skin problems and can assess them with more confidence.

Professional development is an increasing requirement in many parts of the world. In Australia in particular, it is compulsory in order for doctors to maintain their vocational registration. HealthCert's university-recognized courses instill a high degree of confidence in doctors who want to undertake professional development to better help their patients.

The courses are generally short; they are can be completed online while others are face to face with practical sessions in biopsy and surgical techniques. There is also an online exam. Because the course is specifically designed to give doctors the skills and confidence to manage patients, rather than giving them new qualifications, there is no required specialist licensure. The courses are, however, accredited for CME/CPD. There is also a free course that teaches how to conduct a full head-to-toe skin examination and basic dermoscopy at www.skincancer-training.com.

Sub-specialization is increasing as well, which means doctors are seeing more patients in that particular field. The UK has a successful model of sub-specialization for continuous professional development, and Australia is beginning to follow suit. Additional educational opportunities that have developed include the Master of Medicine at the University of Queensland as well as at the University of Graz in Austria, which also has a Master of Science. Other notable education providers are the Royal Australian College of General Practitioners, Australian College of Rural Remote Medicine, and the Australian College of Dermatologists.

Impact

Education and training should be able to improve a doctor's diagnostic skills in two ways: (1) by identifying lesions that otherwise may have been missed and (2) by reducing the number of unnecessary excisions.

In Australia, there is a ratio of 39 benign excisions to 1 melanoma excision for GPs [17], but additional research shows that with further education this ratio can be reduced to 17–1. As more specific education is obtained in regard to the recognition of skin cancer, the ratio falls even further to 8.5–1 [18]. The ability to reduce

the number of unnecessary biopsies will have a profound impact, particularly for a healthcare system that may be under pressure from a funding perspective.

Patient safety is impacted by a doctor's level of skill. A hypothetical situation might be the following: A patient presents with a suspicious lesion, but because his or her clinician is uncertain about what it might be, perhaps because the patient does not have a history of suspicious lesions, it is recommended that the patient does not need to seek further treatment. If the doctor had been trained in dermoscopy, however, and knew specifically how to use and what to look for with a dermatoscope, a better decision could have been made.

Education also reduces waiting times. If a medical professional is able to detect an early-level skin cancer, particularly a melanoma, it can typically be treated within 2–4 weeks. Others that may be in need of more specialist care can be quickly referred. Patient recognition is another area positively affected by training and education. Doctors who complete university-level education are then able to put an award or a certificate on their wall that enables patients to see they have completed professional development classes and have additional skills in a particular area. This is of importance in Australia because some doctors have had no extra training whatsoever, while others have had up to a master's level of additional education. It would be unfair for a patient to believe that these doctors are equally skilled.

Peer recognition is impacted when a doctor has additional training and education. If a general practitioner finds a lesion with which he or she is not comfortable diagnosing or managing, and the patient does not have the insurance and/or wants to wait a year at the local hospital, the GP can then refer the patient to a primary care colleague with more specialized skills. Many doctors now in Australia, once they have obtained a subspecialty skill set, will market themselves to their local GPs for referrals. The National Skin Cancer Centers send referral pads to local GPs to make them aware of the additional skill sets doctors within the centers have developed.

Expanding Internationally

More than 9,500 physicians from 32 countries have completed HealthCert courses at the time of this writing (April 2017). HealthCert is now the largest provider of education for primary care physicians in the world for skin cancer medicine. Three examples of HealthCert's expansion include live presentations in the USA, development of a free online course for the UK's National Health Service (NHS), and an online dermoscopy certificate to diploma course featuring world leading dermatologists/dermoscopists.

Online versions of these courses are becoming more important as HealthCert grows internationally, because distance ought not be an obstacle for additional training and education. The online courses are as effective as those that are live, with the benefit of eliminating the need for travel and time spent outside the office. Practical skills taught in a live environment are still critical. For example, HealthCert uses pork bellies and pig heads as a practice medium to teach doctors how to perform punch and shave biopsies as well as complete deep dermal sutures, elliptical excisions, various flaps, and full-thickness grafts.

International growth can be complicated, however, as different countries have different methods of delivering information to their medical professionals and the potential client may not be the primary care physician. In the USA, for example, the client may not be the family physician or nurse practitioner; it is more likely that the course is sold to a hospital organization of a medical group or health system that does not currently have dermatology services. It also could be a dermatologist who is looking to add this to their skill set for their midlevel providers, such as a nurse practitioner or physician assistant.

In Australia, which is very different from the USA, primary care doctors tend to be sub-contractors who get paid a percentage of the money that they bill for services. As a result, there is an incentive to increase their skills because if they are able to increase the amount they bill, they can take home additional income. In the USA, most doctors are wage employees

who work for large groups. As a result, the incentive to upskill is smaller, because even if they do increase their billings, they are unlikely to see any benefits. (It should be noted that rural doctors or doctors with their own practices do not tend to fall into this category.)

In these particular situations, HealthCert must effectively communicate to the people who run the organization the benefits of obtaining these skills for their primary care physicians and other medical professionals, including physician assistants and nurse practitioners. In the UK at this time, medical treatment still falls under one system, the NHS. Doctors are usually employees of the NHS and, therefore, HealthCert would need to encourage the UK Government to help fund education and upskilling courses.

Europe is a very different picture because there are typically no restrictions on the number of training places for dermatologists as there are in other parts of the world like Australia. As a result, there are many, many dermatologists in Europe and little need for primary care physicians to do this work. Therefore, if we were going to expand our education, particularly in dermoscopy education, then dermatologists would be the craft group for us to train in the future.

Canada is similar to Australia in that they both have smaller populations and a small number of specialists. Here, as in Australia, it would be of great benefit for primary care physicians to become more skilled in dermoscopy, low-level diagnosis, and treatment to take some of the heavy load from the specialists. It is important to understand that dermoscopy is the biggest weapon to fight melanoma. It is an essential skill for dermatologists, primary care physicians, and also, arguably, surgeons. Its impact is very well documented, and it is a skill that not only is easy to learn, but can also be learned through very short training courses.

Teledermatology and Other Educational Projects in the UK and Its Utility in Clinical Practice

Teledermatology is a type of telemedicine that enables medical information to be transferred virtually. There are two basic types:

1. *Real time (RT):* An interactive process that requires all participants be present at the same time, even if based in different locations.
2. *Store and forward (S&F):* Participants need not be present at the same time. For example, with teledermatology, healthcare practitioners in remote areas take a digital image of a suspicious skin lesion, which can be done with a low-cost, off-the-shelf digital camera and dermatoscope. The image is forwarded to a specialist for his or her review, who then documents and returns his or her opinion to the remotely located practitioner. This is known as "store and forward" teledermatology.

It is of particular use in areas of the world where health care is not readily available. In Australia especially, because the population is so widely dispersed and dermatologists are primarily located in capital cities, the practice of teledermatology is becoming more useful. Teledermatology has also been used for several years in the UK through various software and models. This section explores several UK-based projects that have shown positive results.

Educational Projects in the UK

For several years, NHS groups in the UK used proprietary teledermatology software through Australia's HealthCert™ to provide patients in rural areas easier access to dermatological services. With the UK's struggle to keep up with hospital caseloads, teledermatology is proving to reduce costs, and provide patients with faster access to care, especially when a severe skin cancer is present.

With the increased use of teledermatology, it is also important to ensure that healthcare professionals have the necessary skill set to successfully incorporate it into their practice. But current dermatology training in medical school is minimal. The average time spent in this specialization is a 2-week period during a student's clinical year. As a result, clinical exposure to common dermatological issues is low. In a 2012 study completed in Edinburgh, UK, the authors advised that additional training be provided, and that

e-learning tools in particular would be both cost effective and educationally effective [19].

The following provides a brief overview of several UK projects and studies that have reviewed the effectiveness of teledermatology in modern medical practice.

The Somaliland Project

In 2007, Somaliland's first medical school graduated its inaugural class [20]. But the doctors are located across a large geographical area and their access to medical literature and further training is limited. A teledermatology program between the UK and Somaliland has helped ease these limitations [20]. As part of the program, doctors in Somaliland discuss their clinical cases with UK-based tutors who help them pinpoint areas in need of more attention [20].

Regional Study on the Effect of Teledermatology for All Pigmented Lesions

Since 2004, the Medway Maritime Hospital in Kent, UK, has used a teledermatology service that stores images and patient history [21]. A dermoscopy service was added in 2008 [21]. In this particular study, which included patients from the 2-week-wait clinics, researchers looked at the "effect of teledermoscopy on teledermatology of all pigmented lesions [21]." Approximately 1200 images were reviewed in 2008 and 2009 [21].

As a result of the study, more patients were sent directly to surgery and fewer required a second face-to-face evaluation [21]. In addition, slightly more patients were directly discharged after their pre-dermoscopy teledermatology assessment [21]. According to the participating dermatologists, these findings strengthened their certainty that the use of teledermoscopy leads to improved diagnoses [21].

Hertfordshire Teledermatology Pilot Study

This study aimed to determine the reliability and effectiveness of telediagnosis for patients on the 2-week-referral list [9]. Six GP practices uploaded 110 patients' clinical information as well as three digital images per patient [9]). The study ran alongside the normal 2-week-referral path (Bataille et al.)

Each patient received a telediagnosis by two independent dermatologists, as well as face-to-face consultation and histology if deemed necessary [9]. The two independent dermatologists agreed on 78% of cases [9]. In addition, complete agreement was made in 78% of telediagnoses by one independent dermatologist and the face-to-face consultation, and in 73% of telediagnoses by the other independent dermatologist and face-to-face consultations [9].

The study concluded that between 30 and 50% of all 2-week referrals could be "triaged to other non-urgent pathways" [9]. Though it was recommended that the sample size be increased, the study found that triage of patients in the 2-week-referral pathway could reliably be seen via teledermatology for diagnosis [9].

Choose and Book Software

Choose and Book is a patient referral service software used across the UK. It enables secondary care providers to easily review referrals on a secure network and GPs a pathway to upload patient images and discuss their cases with hospital consultants.

The software has a teledermatology service, but it is often underutilized. In one study, researchers reviewed the use of this service over a 6-month period in the dermatology department of a UK teaching hospital [22]. Sub-services that were observed included data storage, image quality, patient consent and selection, GP training, and even local tariff negotiation [22].

The study concluded that Choose and Book's teledermatology service enables patient's quick access to dermatology consultancy and even reduces the need for secondary referrals in some cases [22].

Teledermatology Service in Kent

A primary care teledermatology service was developed with a group of GPs in Kent to "deliver cost-effective dermatology advice without the necessity of the patients travelling to a secondary care centre" [23]. In the pilot study, conducted between February 2010 and January 2011, two dermatologists with teledermatology experience logged into the KSYOS system each day to review waiting referrals and report daily on cases [23]. Four parameters were consistently observed:

(1) reduced referrals, (2) quality improvement, (3) response time, and (4) learning effect. Over the course of the study, 183 cases were received [23]. The study concluded that the teledermatology service led to an average 9-h response time and that 82% of possible referrals to secondary care were prevented [23]. In addition, GPs found the consultant's reply very helpful in 75% of cases, and helpful in 99% [23].

Future Management of Melanoma

Though there is still debate around the benefits of procedures such as sentinel lymph node biopsy, there are current shifts in treatment that will have a significant impact on the diagnosis and treatment of melanoma.

Training

The belief that every primary care physician and nurse should be trained in dermoscopy is increasing. It is a very simple skill to learn and should be integrated into undergraduate programs, particularly where populations are at higher risk. For example, in Australia, the number of thick melanomas has been decreasing to the point that medical providers are finding more earlier, in situ melanomas. In situ melanomas are not only relatively easy to treat, but they can also be treated at a much lower cost. This means that, when provided with the appropriate training, primary care providers can successfully provide treatment, thus preventing patients from having to go through the substantial physical and financial cost of chemotherapy and radiation.

Screenings

Traditionally, skin cancer screening involves evaluating a person's skin type, family history, personal history, and likely environmental factors, to determine whether a person qualifies as high risk.

The Genome Project, however, is changing this traditional screening process and will enable doctors to know in advance whether a patient has a higher propensity to develop skin cancer in the future, thus immediately making them a candidate for regular screening. This will completely change how the screening of high-risk populations is conducted. Based on this, routine screenings for the general population will ideally become the norm, particularly in areas of the world where melanoma is a high risk. But currently, its cost is still prohibitive in many places.

Teledermatology

At this time, teledermatology is mainly available business-to-business; it is a service used between a primary care doctor and dermatologist. In the future, however, with the continued development of technology, it will increasingly become a direct-to-consumer option. Advancements in teledermatology will enable patients to conduct a self-diagnosis, take clinical and dermatological images of a suspicious lesion, and send them directly to a dermatologist or other skin cancer doctors. In the future, artificial intelligence (AI) will have a profound impact on dermatology service delivery, especially rashes and infections.

Some of these advancements are already in progress. There are now in existence dermatoscopes, made for less than 10 dollars, that can be attached to smartphones with dermatoscope-specific slipcases. In addition, smartphones will likely have high enough resolution to take clinical images clear enough for a medical care provider to evaluate a suspicious lesion.

Digital Full-Body Imaging

The best example of digital full-body imaging at this time is the Canfield Vector WB360, which is currently only available in two research facilities. This tool is composed of a frame with 46 SLR cameras attached to it that can take one

image and stitch it together into a 3D body map capable of identifying changes on the body as small as 1 mm.

Using a tool such as this will drastically alter the future management of melanoma. During a skin cancer screening, a patient will get undressed and stand in front of the device, which will then take a photograph and analyze what is new or changing on the patient's body. Then, based on this analysis, the doctor or nurse will discuss with the patient what next step ought to be taken.

Currently, digital full-body imaging is prohibitively expensive, but it is expected that advanced tools such as this will become cheaper and more readily available every 18 months as per Moore's law.

New Immunotherapy Drugs for Melanoma

Drugs such as ipilimumab, nivolumab, and pembrolizumab are capable of treating late-stage melanoma and are specifically for patients for which little can be done because their cancer is so advanced. However, they are relatively new and very expensive, and unfortunately, in some places, the government does not subsidize or reimburse for them. It is reasonable to assume that they will become more readily available and affordable in the future. Based on advancements with these medications, the following question must be asked: Will there eventually be a vaccine for melanoma? The advancements of technology and the changes occurring in how cancer is diagnosed and managed make it reasonably foreseeable that, in the future, patients will not die from skin cancer.

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