NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Diagnostics Assessment Programme

Skin cancer: the VivaScope 1500 and 3000 systems for detecting and monitoring skin lesions

Final scope

October 2014

1 Introduction

The VivaScope 1500 and 3000 systems are manufactured by Caliber Imaging and Diagnostics, and distributed by MAVIG. The Medical Technologies Advisory Committee identified the VivaScope 1500 and 3000 imaging systems as potentially suitable for evaluation by the Diagnostics Assessment Programme on the basis of a briefing note that included a description of the purpose of the technology as detailed in section 2.1. The revised scope was informed by discussions at the scoping workshop held on 1st September 2014 and the assessment subgroup meeting held on 19th September 2014.

A glossary of terms and a list of abbreviations are provided in appendices A and B.

2 Description of the technology

This section describes the properties of the diagnostic technology based on information provided to NICE by the manufacturer and on information available in the public domain. NICE has not carried out an independent evaluation of this description.

2.1 Purpose of the medical technology

The VivaScope 1500 and 3000 imaging systems are non-invasive, high resolution reflectance confocal microscope systems that are designed to help diagnose potentially malignant skin lesions. They are intended to provide a highly magnified image of skin cells that is reportedly comparable to microscopic examination of a skin specimen (biopsy). The images obtained present a surface-down view of the skin and so may be most suitable for viewing layers of the epidermis rather than determining tumour thickness. The VivaScope imaging systems provide information on the upper layer of skin

and capture in vivo real time effects, such as blood flow, which is intended to inform clinical decisions. They are designed for use in dermatology outpatient and surgery settings. The VivaScope imaging systems are designed to be used in conjunction with dermoscopy in the investigation of suspicious lesions, to delineate tumour margins in preparation for excision or to monitor healing processes in response to treatment. It is claimed that these systems have higher diagnostic accuracy than visual assessment of skin lesions by eye or dermascope, which could potentially result in fewer invasive biopsies. It is also claimed that using the VivaScope imaging systems could lead to identification of tumours at a more curable stage, give more accurate pre-surgical margins and provide better treatment monitoring. This could result in fewer hospital visits and lower treatment costs.

2.2 Product properties

2.2.1 VivaScope 1500 system

The VivaScope 1500 system is a non-invasive reflectance confocal microscope (RCM) system that uses a near infrared (NIR) point-laser light to obtain images of the top layers of the skin. These images are intended to be highly magnified such that they are quasi-histological, that is, comparable to microscopic examination of skin cells. The VivaScope 1500 system is console based and operates at a single wavelength, 830nm.

The VivaScope 1500 system includes software that is designed to analyse, store and display real-time images of skin tissue in vivo including skin cells, blood vessels, collagen and pigment. These images present a surface-down view of the skin and may provide information regarding cell structure of the skin lesion and the architecture of the surrounding tissues. This may help a clinician to form a clinical judgement and provide a positive or negative diagnosis of a cancerous skin lesion. As the images do not provide a transverse view of the skin, tumour thickness would typically be determined by histological examination of a biopsy.

The VivaScope 1500 system attaches to the skin via a magnetic ring attachment with a disposable adhesive window and a transparent, low refractive index medium between the skin and lens system. The system automatically scans the area of skin to which it is attached and is reported to image the upper layer of the skin to a depth of 250 micrometres (superficial reticular dermis) at a resolution (ability to distinguish detail) of 1.25 micrometres. Overall, the set-up time to attach the system and obtain an image is around 10 minutes, although this may vary depending on the experience of the user. The system is intended for diagnosing skin cancers

and identifying lesions requiring surgery, identifying the margins of lesions before and after surgery, and in monitoring the impact of non-invasive treatments.

Another version of the VivaScope 1500 system is the VivaScope 1500ML (Multilaser) system. This system is intended for use with fluorescent dyes for imaging skin in vivo or ex vivo, and is currently used in research settings.

2.2.2 VivaScope 3000 system

The VivaScope 3000 is a hand-held unit and is technically similar to the VivaScope 1500 system. It operates with a single laser (830nm) and is capable of imaging the upper layer of the skin (superficial reticular dermis) at a resolution (ability to distinguish detail) of 1.25 micrometres. The hand held device is designed for imaging lesions in more difficult to reach areas, such as around the nose, eyes, ears, lips and gums. Unlike the VivaScope 1500 system, the VivaScope 3000 is not attached to the skin surface but can be moved freely across the surface. The Vivascope 3000 system is also intended for diagnosing skin cancers and identifying lesions requiring surgery, identifying the margins of lesions before and after surgery and in monitoring the impact of non-invasive treatments.

3 Target conditions

Skin cancer

Skin cancer is commonly classified into two main types; melanoma skin cancer (MSC) and non-melanoma skin cancer (NMSC). Melanoma skin cancers develop from melanocytes, skin cells that produce the skin-darkening pigment, melanin, while non-melanoma skin cancers develop from the proliferation of the cells that produce the skin structural protein, keratin (keratinocytes). These two categories of cancer include more than 95% of all reported skin cancers.

3.1 Melanoma Skin Cancer (MSC)

Melanomas develop from cells (melanocytes) lying in the deeper layers of the epidermis. Though uncommon, melanoma incidence rates increased 7 fold between 1976 and 2009. In the UK, it is most common in people aged 50 years and over although a fifth of cases occur in young adults. The increase in incidence of melanoma may be caused by increased surveillance but it is estimated that over 80% of cases are linked to UV exposure that is related to recreational behavioural change involving sun exposure and the use of

sunbeds (Cancer Research UK, 2014). The incidence of melanoma is lower in lower socio-economic groups.

Malignant melanoma can invade nearby tissue and potentially spread to other parts of the body. It is responsible for the majority of skin cancer deaths and in the UK in 2010 there were approximately 2200 deaths and 12,818 new cases of malignant melanoma. Survival has improved substantially in recent decades and the survival rate is among the highest of any cancer, largely as a result of increased awareness, earlier diagnosis and better treatments. (Cancer Research UK, 2014)

Treatment is more likely to be successful when melanoma is detected in its early stages. In the UK, the majority of malignant melanomas are diagnosed at an early stage; 82% in men and 87% in women presented at stages 1 or 2 in 2010. In men, most melanomas present on the trunk (41%), head/neck (22%) or arms (19%). In women the most common sites for presentation are legs (39%), arms (24%) and trunk (20%).

Melanomas may be classified into a number of broad types depending on their growth characteristics, appearance and location on the body (Table 1).

Table 1: Types of melanoma

(The prevention, diagnosis, referral and management of melanomas of the skin – Concise Guidelines: Royal College of Physicians/British Association of Dermatologists, 2007)

Type	Description
Superficial spreading melanomas	**Slow growing initially: develop across the skin at first for months before they acquire the capacity for invasion. The physician therefore has the potential to diagnose at a curable phase.** **This is the commonest type of melanoma**
Nodular melanomas	**Grow more rapidly down into the skin having acquired the capacity for invasion from the beginning** **More common in older individuals.**
Lentigo maligna melanomas	**Develop in a slow-growing precursor pigmented macule called a lentigo maligna or Hutchinson's freckle, which may remain in situ and incapable of metastasis for very many years. Only about 5% of Lentigo maligna lesions transform to become malignant. However, once a melanoma develops, these variants are as aggressive as others of similar thickness. Much more common in people over 60 years old**
Acral lentiginous melanomas	**The rarest type. Found on the soles or palms or under the nail (subungual).** **Occur in all ethnic groups. Thought to be unrelated to sun exposure aetiologically**

3.2 Non-melanoma Skin Cancer (NMSC)

Non-melanoma skin cancers are a group of very common cancers, estimated to account for around a third of all cancers detected in the UK. 102,628 cases of non-melanoma skin cancer were recorded in the UK in 2011. However, the true number of cases is thought to be higher because not all cancers are recorded by the cancer registries. Non-melanoma skin cancers most commonly develop from epidermal cell, keratinocytes, which produce the skin strengthening protein keratin. The two most common types of non-melanoma skin cancer are Basal Cell Carcinoma (BCC) and Squamous Cell Carcinoma (SCC). Basal cell carcinoma develops in keratinocytes deep in the epidermis, while squamous cell carcinoma develops from keratinocytes elsewhere in the skin. Other types of cell in the epidermis may also give rise to malignancy, though these cancers are far less common, and include Karposi sarcoma, Merkel cell carcinoma and T-cell lymphoma.

Of the two types of non-melanoma skin cancer, squamous cell carcinoma is the more serious; basal cell carcinoma is rarely fatal. However, if basal cell carcinoma is not diagnosed early enough – or is not properly treated – it can result in tumours that destroy important anatomical structures, such as the nose, eye, ear and lips. As such, it can be more challenging to treat and can result in the tumour becoming inoperable. Squamous cell carcinomas can also be disfiguring and, if they spread, fatal.

3.2.1 Squamous Cell Carcinoma

Squamous cell carcinoma is a malignant tumour which is locally invasive and has the potential to spread to other parts of the body. It is the second most common skin cancer with 26,000 cases in the UK in 2011 and its incidence is increasing. Chronic UV exposure is a key risk factor and squamous cell carcinoma is commonest in those with sun-damaged skin. This cancer begins in keratinocytes in the epidermis and most often develops in areas that have been exposed to the sun such as parts of the head, neck, and on the back of the hands and forearms. Some skin conditions can progress to squamous cell carcinoma. This includes actinic keratosis (also known as solar keratosis), a condition that particularly affects sun-damaged skin. Squamous cell carcinomas can also develop in scar tissue and areas of the skin that have been ulcerated. Individuals with impaired immune function, such as those receiving immunosuppressive drugs, are also at risk of squamous cell carcinoma. Some squamous cell carcinomas can be difficult to view using

imaging techniques because their upper surface is often scaly, which can make it difficult to obtain sufficient resolution (detail).

3.2.2 Basal Cell Carcinoma

Basal cell carcinoma is the most common type of skin cancer. About 75 out of every 100 cases of non-melanoma skin cancers diagnosed are this type – approximately 76,000 cases in 2011. These cancers develop from basal cells in the deepest layer of the epidermis and around the hair follicle. Like squamous cell carcinoma, it is most likely to develop in areas of skin exposed to the sun. These areas include parts of the face, such as the nose, forehead and cheeks. It can also develop on the back or lower legs. It is most often diagnosed in people in middle or older age.

Basal cell carcinomas are also known as rodent ulcers, which may begin as a small lump. The edges of the lump usually have a shiny or pearly look with a depressed center, which may become crusty or ulcerate. Rodent ulcers do not usually hurt unless knocked but they can be itchy and may bleed if scratched. If the ulcer is not treated it can grow and become wider and deeper, affecting more skin tissue. Rodent ulcers can also affect other types of tissue, such as cartilage or bone. However, advanced rodent ulcers are very rare in the UK because most people get treatment at an early stage.

There are a number of different subtypes of basal cell skin cancers. These include nodular (the commonest – around 50% of all basal cell carcinomas), superficial, morphoeic and pigmented. Each of these subtypes looks and behaves differently. If low risk, the nodular forms can be removed in primary care.

It is unusual for basal cell skin cancer to spread to another part of the body to form a secondary cancer but it is possible to have more than one basal cell cancer at any one time. People who have already had one basal cell carcinoma are at greater risk of developing subsequent basal cell carcinomas.

3.3 Patient issues and preferences

A new diagnosis of cancer can cause a person to experience a complex range of emotions, including anxiety, upset and depression. People receiving a diagnosis of cancer are likely to require sensitivity when being provided with information and receive support carefully tailored to their individual needs.

Some people may fear scarring when an invasive surgical procedure is needed to remove their skin lesion. This fear can be increased when the skin lesion is present on a visible area of the body, such as the face. Scarring may

have a psychological impact and can lead to low self-esteem and confidence, particularly in social situations. In some cases, the psychological consequences of scarring can become extreme and lead to the development of social phobias. This can impact on attendance at school, work and participation in personal and social activities.

Some surgical procedures may require complex, multiple surgeries for successful treatment, for example, Mohs micro surgery. Other surgical procedures may require repeating in the case of recurrence or longer-term follow up. Attending surgical procedures can cause anxiety and result in absence from work and social activities. It can also cause inconvenience to patients, family members and carers arising from the need to travel for follow-up treatment.

3.4 Diagnostic and care pathways

The vast majority of skin lesions will initially be examined in a primary care setting. As melanoma is still a relatively infrequent cancer in primary care, the initial diagnosis of suspicious skin lesions in primary care should follow the British Association of Dermatologists ABCD-Easy rules (BAD 2011):

- Asymmetry - the two halves of the area may differ in their shape.
- Border - the edges of the area may be irregular or blurred, and sometimes show notches.
- Colour - this may be uneven. Different shades of black, brown and pink may be seen.
- Diameter - Most melanomas are at least 6mm in diameter. Report any change in size or diameter to your doctor.
- Expert - if in doubt, check it out! If your GP is concerned about your skin, make sure you see a Consultant Dermatologist

Any lesions which cannot be considered definitively non-cancerous should be referred on to a skin specialist. NICE guidance, Cancer Service Guidance for people with Skin Tumours including Melanoma Improving Outcomes for People with Skin Tumours including Melanoma (2010), recommends that health professionals who knowingly treat patients with any type of skin cancer should be members of a multidisciplinary skin cancer team [Local hospital Skin cancer Multi-Disciplinary Teams (LSMDTs) or Specialist Skin cancer Multi-Disciplinary Teams (SSMDTs)]. These referrals should be made under the two week rule; people with symptoms of cancer are urgently referred to a specialist and should be seen by a specialist within two weeks of being referred.

In England (2006-8), 68% of malignant melanomas were diagnosed by a specialist as a result of a GP referral, either as a two week wait referral (41%) or a routine or urgent referral when the patient was not referred under the two week rule. 39% were diagnosed after presenting as an emergency via A&E, other emergency hospital admission/referral or as an emergency GP referral.

Suspected non-melanoma skin cancer presenting in primary care should be referred for specialist opinion either under the two week rule (squamous cell carcinoma) or as a normal referral. All patients who present in primary care with a possible cutaneous squamous cell carcinoma should be referred urgently under the 2 week rule to a skin specialist, as in the case of suspected melanoma. Basal cell carcinoma should be referred as a normal referral – though low risk basal cell carcinoma can be dealt with in a community setting by a suitably qualified level one practitioner (GP).

3.4.1 Melanoma

The management of cutaneous melanoma is outlined in the British Association of Dermatology Revised UK Guideline (Marsden et al. 2010). Where a suspicious skin lesion presents and there is a need to exclude melanoma, the lesion will normally be examined using a dermatoscope (a handheld, specialised magnifying device). The lesion is photographed and then the whole lesion, together with a clinical margin of 2mm of normal skin, is completely removed (excision biopsy). This allows tumour staging by measuring the thickness of the tumour in the tissue (Breslow thickness).

For large lesions, shave biopsies, which only remove part of the lesion may be performed but this can increase the risk of sampling error and may make staging the tumour difficult. Punch biopsy or incisional biopsy is occasionally used, for example, in the differential diagnosis of lentigo maligna or of acral melanoma which can have a wide spread across the skin. These types of biopsy are only carried out by the skin cancer multi-disciplinary team (MDT).

All suspected melanoma lesions that are removed should be sent for histopathological review to the pathologist associated with the specialist skin cancer team. Histological reporting should follow the requirements set out in the British Association of Dermatologists Guidelines for management of cutaneous melanoma.

If it is not possible to distinguish pathologically between a melanoma and a benign melanoma lesion, the patient should be referred to the specialist MDT for clinical and pathological review. The decision to treat as a melanoma should be made in discussion with the patient.

Surgery is the only curative treatment for melanoma and, if there is pathological confirmation of malignancy, surgical excision with a wider and deeper margin is carried out to ensure complete removal. The lateral margins for excision depend on the tumour thickness.

Lentigo maligna and other superficial in situ melanomas with no potential for metastatic spread should be excised completely with a clear histological margin. No further treatment is necessary. Complete removal is recommended because of the risk of sub-clinical microinvasion. Incisional biopsy may miss this because of sampling error. Lentigo maligna can present a diagnostic challenge as it can cover a large area on sites such as the face, and have varied histology and diffuse boundaries. In older people the risk of progression may be low, so surgery may be deemed inappropriate and other treatments such as radiotherapy or observation may be more appropriate. Local recurrence of the cancer occurs in about 5% of patients by 2 years, which may be caused by a failure to completely remove cancer cells around the margin of the excision.

3.4.2 Non-melanoma

3.4.2.1 Squamous cell carcinoma

Squamous cell carcinoma should be referred under the two week rule (as is suspected melanoma). *In situ* squamous cell carcinoma may be treated by a suitably qualified GP in primary care.

Diagnosis is established histologically following biopsy and the margins of excised tissues may be stained before histological preparation to establish the peripheral and deep margins. The majority of squamous cell carcinomas are low risk and amenable to a number of treatments. However, identification of the high risk cases needs to be managed by a specialist skin team.

The aim of treatment is to remove the primary tumour and any metastases. This requires accurate margin assessment. The gold standard for margin identification is currently histology. However, most treatments rely on clinical judgement which may not accurately predict the extent of the tumour in the absence of a well-defined margin.

The British Association of Dermatology guideline (2011) states where feasible, surgical excision techniques, (including Mohs surgery) should be considered as the first choice treatment for squamous cell carcinoma as these techniques provide histological confirmation of tumour removal. Mohs micro surgery involves the removal of tumours to predefined margins, carefully mapped to match the histopathology. The tissue removed from the tumour is

processed histologically and examined to identify the further areas of tissue to be removed. This continues till the margins are shown to be clear of cancer cells. It requires close integration of surgical and histological capacity (BAD/BSDS, 2011).

In surgical excision a margin of a minimum of 4mm is recommended in clinically well-defined, low risk tumours. A narrower margin is more likely to leave residual cancer cells, which can cause recurrence. Ill-defined tumours more than 2cm in diameter, tumours that are moderately or poorly differentiated, or tumours on the ear, lip, scalp, eyelids or nose should be removed with a wider margin – 6mm or more or with Mohs surgery. The concept of clinical margin is thus of great importance in predicting successful excision.

3.4.2.2 Basal cell carcinoma

Nodular basal cell carcinoma may be removed in community settings by suitably qualified GPs. However, if there is uncertainty in the diagnosis or the appropriate treatment cannot be provided in primary care, referral should be made to the specialist skin cancer team (Improving outcomes for people with skin tumours including melanomas, 2010). Basal cell carcinomas would normally be referred from primary care as a non-urgent referral rather than via the two week process.

Following diagnosis by dermoscopy and histology, basal cell carcinoma can be treated non-surgically through medical treatments such as imiquimod, or by curettage, cautery or laser ablation (BAD, 2008). However, higher risk basal cell carcinomas may require a more aggressive approach and surgical removal to clear margins – either by excision or by Mohs surgery. Incomplete excision increases the risk of recurrence. Mohs surgery is a very successful treatment for high risk basal cell carcinoma and for high risk recurrent basal cell carcinoma.

4 Scope of the evaluation

Table 1: Scope of the evaluation

Decision question	1. What is the clinical effectiveness and cost effectiveness of using the VivaScope 1500 and 3000 imaging systems to rule out biopsy of skin lesions relative to current practice? 2. What is the clinical effectiveness and cost effectiveness of the VivaScope 3000 imaging systems in defining the margins of skin lesions relative to current practice?
Population	1. People with equivocal skin lesions and people with lentigo maligna If evidence permits, the following sub-populations will be included: • People with suspected melanoma • People with suspected basal cell carcinoma • People with suspected squamous cell carcinoma 2. People with skin lesions that require excision surgery. If evidence permits, the following sub-populations will be included: • People with melanoma • People with basal cell carcinoma • People with squamous cell carcinoma • People with lentigo maligna
Interventions	VivaScope 1500 and VivaScope 3000 imaging systems
Comparator	1 Examination of skin using dermoscopy and clinical judgement to detect potentially cancerous lesions 2 Examination of skin using dermoscopy and clinical judgement to determine tumour margins
Healthcare setting	Secondary Care

Outcomes	*Decision question 1: Diagnosis* Outcomes may include: • Diagnostic accuracy • Time to test result • Test failure rate e.g. imaging failure • Number of scans deemed impractical because of the site of the lesion • Number of biopsies performed and repeat biopsies • Morbidity associated with biopsy such as pain and swelling • Extent of scarring and associated psychological impact • Adverse events from biopsy including infections • Adverse events from false test results including patient distress and sequelae • Health related quality of life *Decision question 2: Defining tumour margins* Outcomes may include • Diagnostic accuracy • Time to test result • Test failure rate e.g. imaging failure • Number of surgical procedures/surgical stages • Morbidity associated with excision surgery such as pain and swelling • Extent of scarring and associated psychological impact • Adverse events from surgery including infections • Adverse events from false test results including patient distress and sequelae • Recurrence rates • Health related quality of life
	Costs will be considered from an NHS and Personal Social

	Services perspective. Costs for consideration may include: • Costs of equipment • Costs of staff and training of staff • Maintenance costs • Costs of procedures including biopsy, histological examination and surgery and associated time • Medical costs arising from ongoing care following test results including those associated with surgery, time spent in hospital, and treatment of cancer. • Medical costs arising from adverse events including those associated with biopsies, surgery, and false test results.
	The cost-effectiveness of interventions should be expressed in terms of incremental cost per quality-adjusted life year.
Time horizon	The time horizon for estimating clinical and cost effectiveness should be sufficiently long to reflect any differences in costs or outcomes between the technologies being compared.

5 Modelling approach

5.1 Existing models

The published skin cancer economic models identified are aimed at melanoma prevention and its cost effectiveness, rather than the use of interventions for diagnosing and monitoring skin cancer.

The VivaScope 1500 and 3000 systems are intended for diagnosing skin lesions and for defining the tumour margins. Therefore, two models will be necessary; one to look at the diagnostic indication and one to look at the surgical indication.

6 Potential equality issues

NICE is committed to promoting equality of opportunity, eliminating unlawful discrimination and fostering good relations between people with particular protected characteristics and others.

As these cancers have a link to UV light exposure they are more prevalent in white skinned individuals.

The risk of the majority of skin cancers increases with age. Older people may also be more likely to be in receipt of other treatments, such as anticoagulation and poor wound healing, which limit the desirability of biopsy approaches.

People with cancer are protected by the Equality Act 2010 from the point of diagnosis.

People who are HIV positive and immunocompromised are at higher risk of squamous cell carcinoma, as well as certain of the rarer skin cancers, such as Kaposi's sarcoma.

7 Potential implementation issues

A substantial amount of time and resources may be required to train staff in the use of the technology and in interpreting the electronic images. For example, dermatologists may require training in the interpretation of quasi-histopathological images to correctly interpret the VivaScope images.

The initial setup time to attach the VivaScope 1500 device over a lesion and obtain an image is estimated to be 10 minutes although this may vary depending on the experience of the user. In a clinical setting, this may mean that an "operator" is required to setup the device, leaving the clinician free to see other patients until the images are available.

Appendix A Glossary of terms

Actinic keratosis, also known as *solar keratosis*: a pre-cancerous skin condition caused by too much exposure to the sun. In some cases, actinic keratoses may turn into squamous cell cancers. Most actinic keratoses do not become cancers, but it can sometimes be hard for doctors to tell these apart from true skin cancers, so doctors often recommend treating them.

Basal cell carcinoma (BCC): a slow developing cancer of the epidermis that usually occurs on the face and is associated with intensive ultraviolet radiation (UV) exposure in childhood and adolescence, particularly in those who burn easily.

Dermatoscope: a handheld magnifying glass with a polarised light source, also called a dermascope or epiluminescent microscope.

Melanoma skin cancer: types of cancer developing from the pigmented cells (melanocytes) of the epidermis. This classification includes melanomas, which can become malignant and spread and lentigo maligna, which also has the capacity to spread.

Mohs Surgery: a complex form of surgery where tissue is removed, examined histologically and mapped to the boundaries of the lesion to guide the further removal of tissue. It can be time-consuming and expensive but has a high cure rate.

Near infra-red (**NIR) light**: this is light at the infra-red end of the spectrum which is not visible to the human eye but can be used extensively in medicine. Human tissues transmit and absorb NIR depending on important factors, such as their haemoglobin content.

Non-melanoma skin cancer: types of cancer developing from the epidermal cells involved in the production of the skin protein keratin. These keratinocytes can develop into either basal cell carcinomas – if the cells lie deep in the epidermis – or squamous cell carcinomas – if keratinocytes elsewhere in the skin are involved.

Quasi-histological: offering a high resolution view of cells similar to that obtained by tissue removal (biopsy), processing and microscopic examination.

Reflectance confocal microscope (Confocal imaging/microscopy): confocal microscopy uses a small point (laser) light source and lenses focussed on the same point, combined with a confocal pinhole filter which means only the light from the plane of focus reaches the detector. This means all the out of focus light is not detected giving a very high resolution clear image. However, this requires much enhanced optical systems because most of the light is filtered out at the pinhole detector.

Squamous cell carcinoma (**SCC):** a cancer of the outermost layer of skin cells and is associated with chronic UV radiation exposure in the earlier decades of life

Appendix B Abbreviations

BCC - Basal Cell Carcinoma

SCC - Squamous Cell Carcinoma

MSC - Melanoma Skin Cancer

NMSC - Non-Melanoma Skin Cancer

RCM - Reflectance Confocal Microscopy

OCT – Optical Coherence Tomography

MPT – Multi-Photon Tomography

Appendix C Related guidance

- **Published NICE guidance**

Electrochemotherapy for primary basal cell carcinoma and primary squamous cell carcinoma. Interventional procedure guidance IPG447 (March 2013). Available from: http://guidance.nice.org.uk/IPG447

Electrochemotherapy for metastases in the skin from tumours of non-skin origin. Interventional procedure IPG44 (March 2013). Available from: http://guidance.nice.org.uk/IPG446

Ipilimumab for previously treated advanced (unresectable or metastatic) melanoma Technology appraisal guidance TA268 (December 2012). Available from: http://guidance.nice.org.uk/TA268

Vemurafenib for treating locally advanced or metastatic BRAF V600 mutation-positive malignant melanoma. Technology appraisal guidance TA269 (December 2012). Available from: http://guidance.nice.org.uk/TA269

Ambulight PDT for the treatment of non-melanoma skin cancer. Medical technology guidance MTG6 (July 2011). Available from: http://guidance.nice.org.uk/MTG6

Endoscopic radical inguinal lymphadenectomy. Interventional procedure guidance IPG398 (June 2011). Available from: http://www.nice.org.uk/guidance/IPG398

Skin cancer prevention: information, resources and environmental changes. Public health guidance PH32 (January 2011). Available from: http://guidance.nice.org.uk/PH32

Improving outcomes for people with skin tumours including melanoma. Cancer service guidance CSGSTIM (May 2010). Available from http://guidance.nice.org.uk/CSGSTIM

Photodynamic therapy for non-melanoma skin tumours (including premalignant and primary non-metastatic skin lesions). Interventional

procedure guidance IPG155 (February 2006). Available from: http://guidance.nice.org.uk/IPG155

Intralesional photocoagulation of subcutaneous congenital vascular disorders. Interventional Procedure guidance IPG90 (September 2004). Available from: http://www.nice.org.uk/guidance/IPG90

- **NICE guidance in development**

Melanoma: assessment and management of melanoma. Clinical Guideline. Status: referred. Publication date: TBC.

Dabrafenib for the treatment of BRAF V600 mutation positive, unresectable, advanced or metastatic melanoma. Technology Appraisal. Expected: December 2014.

Dabrafenib and trametinib for treating advanced unresectable or metastatic BRAFV600 mutation-positive melanoma. Technology Appraisal. Expected: September 2014.

NICE pathways

The VivaScope imaging systems guidance will be included in several NICE pathways, for example:

NICE Guidance, Preventing Skin Cancer - Overview.

Relevant guidance from other organisations

British Association of Dermatologists: Revised UK guidelines for the management of cutaneous melanoma. Marsden JR et al. 2010.

Scottish Intercollegiate Guidelines Network (SIGN) Cutaneous Melanoma: A national clinical guideline. July 2003.

Royal College of Physicians/ British Association of Dermatologists Concise Guidance to Good Practice Number 7. The prevention, referral and management of melanoma of the skin. Sept 2007.

Appendix D References

Royal College of Physicians/British Association of Dermatologists (2007). Concise Guides to Good Practice no 7. The prevention, diagnosis, referral and management of melanoma of the skin.

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British Association of Dermatologists (2009). Multi professional Guidelines for the management of the patient with primary cutaneous squamous cell carcinoma; Motley RJ, Preston PW, Lawrence CM.

Marc AL et al. (2014) High definition optical coherence tomography imaging of melanocytic lesions: a pilot study. Arch Dermtol Res 306 pp11-26

Marsden JR et al. (2010). British Association of Dermatologists Revised UK Guidelines for the management of cutaneous melanoma. British Journal of Dermatology 163 pp238-256.

Cochrane Collaboration (2010). Surgical excision margins for primary cutaneous melanoma. Sladden MJ, et al. *Cochrane Collaboration on line.*

British Association of Dermatologists (2008). Guidelines for the management of basal cell carcinoma. British Journal of Dermatology 159 35-48. Telfer NJ, Colver GB and Morton CA.