Today's Challenge, Tomorrow's Innovation

CHALLENGE STATEMENT #04

1. **Challenge Owner Index and Pseudonym**
   #04 – ABC

2. **Challenge Statement**

We are looking for a learning solution that allows medical education to be delivered via an engaging, self-paced, adaptive and easily accessible platform, allowing learners to acquire a new set of clinical skills in using dermoscopy (skin surface microscopy) to detect skin cancer by simulating the experience of examining the skin and training the learner to detect suspicious features.

3. **About the Challenge Owner Organisation**

We are the dermatology department in a large tertiary hospital in Singapore, treating a broad spectrum of skin diseases in the inpatient and outpatient setting. As a teaching hospital, our organization is committed to providing quality medical education for medical students and junior doctors in training.

4. **Define the Challenge**

Current Situation
Skin cancer is one of the top ten most frequently diagnosed cancers in Singapore, with an upward trend over recent decades. It is therefore increasingly important that the clinician be more cognizant of a growing proportion of patients who may present with skin cancer.

In the current clinical landscape of Singapore there is a deficiency of expertise & knowledge regarding skin cancers amongst non-dermatologists (e.g.- general practitioners, junior residents, and surgeons), to whom majority patients with skin cancer may first present. Failure to recognize skin cancer may result in delay and increased morbidity/mortality, whereas clinically over-diagnosing benign skin lesions as cancer would lead to unnecessary surgery, inflating healthcare costs.

Dermoscopy (examination of the skin using surface microscopy) is a useful portable bedside tool to help the clinician correctly identify malignant and benign lesions. It is a relatively new technology, being more widely used only during the past 10 years. However, at present, it is rarely practised by non-dermatologists, as they are not trained in dermoscopy. In Singapore, dermoscopy is a skill that is limited to dermatologists.This is in contrast to countries such as Australia where public awareness of skin cancer is high and even general practitioners (GPs) use dermoscopy to detect skin cancer in their patients.

Although a dermoscope is easily available, there is a lack of trainers in Singapore. If we are to extend the knowledge of dermoscopy to GPs/other doctors in the future and even make dermoscopy part of the curriculum for younger doctors, we require a platform that can circumvent the need for a human

teacher. There is an open public repository of dermoscopy data (images, diagnoses) that may be used for such education.

We are looking for a solution that can train the learner (a junior doctor or medical student) to use a dermoscope, with clear instructions.

As with any newly learnt skill, dermoscopy education has an inherent learning curve. Normal dermoscopy training requires around 9 months (1 month of theory followed by 3 months of practical training and 6 months to learn rarer conditions). Yet with an effective platform that encourages the learner to engage in daily practice, this competency may be achieved in a shorter time – realistically 2-3 months.

The medical educators in our organization need a stimulating learning platform that allows dermoscopy education to be presented to medical students and junior doctors in an engaging, interactive and easily accessible manner, bringing this skill to a local audience via e-learning. This would encourage constant interaction with the platform, constant repetition and provide learner feedback (all proven techniques in traditional learning). Ultimately this would empower more clinicians with dermoscopy skills that will enable timely diagnosis of skin cancer. Once developed, this platform may be used beyond dermatology, in other areas of medical education

Past & Current Solutioning Efforts
Dermoscopy is a skill set that has been incorporated relatively recently and is currently taught mostly through didactic lectures and workshops. At present, dermoscopy education is not available to medical students and non-dermatologists in an easily-accessible, bite-sized, self-paced, engaging format. Additionally, restrictions due to the current COVID-19 pandemic make it difficult to provide the current modes of training (ie workshops) to new doctors in Singapore. As a result, most non-dermatologists are not equipped with the valuable tool (dermoscopy) that would enable them to effectively diagnose a skin cancer early and refer the patient to a dermatologist for timely and appropriate treatment.

Challenge / Gap / Unrealised Potential
Skin cancer is one of the top ten most frequently diagnosed cancers in Singapore, with a steady upward trend over recent decades. Most patients in the community will first present with a skin lesion to a doctor in the primary care setting (at a family physician's clinic) or to a junior doctor in the hospital. However, if dermoscopy education continues to remain available only to dermatologists:
1. Patients will continue to have skin cancers that are not diagnosed in a timely manner. Failure to recognize a potentially cancerous skin lesion and choosing instead to observe it may result in unnecessary (and dangerous) waiting periods during which treatment would be delayed.
2. Doctors without dermoscopy training may incorrectly diagnose lesions as skin cancer, as they are unaware of the dermoscopic features of skin cancer. Over-diagnosing skin lesions as cancer would lead to unnecessary surgery for benign lesions, inflating healthcare costs.

In addition to the above, we realize that the patient population in Singapore poses another challenge. Most dermoscopy training images from the West feature Caucasian skin. However, the multi-ethnic community of Singapore means that the clinician must be able to diagnose skin cancers on various skin types in Asian skin. We (the challenge owners) possess clinical images of dermoscopy in Asian skin, and these data if used, need to be protected under PDPA.

5. Targeted Learners / Users

The primary target learners are 100 medical students (from one medical school) and 50 junior doctors (from one hospital). We hope to expand our solution to medical students from all medical schools in Singapore, as well as to junior doctors at all government hospitals. Once developed, this platform may be used in other areas of medical education. We are currently building a collection of images for Artificial Intelligence development. These images may also be used for the medical education platform.

Medical students and junior doctors need dermoscopy education delivered in an engaging, easily accessible format. Majority of these learners have stressful, busy schedules (are under severe time-constraints), do not have a dedicated office space to sit (space constraint) and are often sleep-deprived (limited energy and attention reserves in their free time).

The secondary users of the solution are dermoscopy trainers. These trainers (dermatologists) would design simulation scenarios, update the date and assessments. They generally do not have experience in coding yet need to be able to interact with the platform with ease.

6. Deliverables

We are looking for a Solution Partner to design and develop an in-house training platform to help learners acquire a new skill set.

As the platform is for medical education, our solution partner needs to be familiar with healthcare PDPA and be comfortable working with clinical images.

While the curriculum for training will be provided by clinicians, our solution partner must be capable of creating a platform to deliver the content as bite-sized, engaging and rewarding learning experiences

7. Expectations of Solution

- The solution should allow for simulation of visually inspecting a patient's skin lesion (eg – a suspicious looking mole).
- The solution must simulate the set of tools that a doctor would have access to when examining the skin.
- The solution must factor in the time constraint involved when examining a patient's skin lesion.
- The solution must provide immediate feedback on how the user is performing, with incentives to improve performance and reach higher levels of proficiency.
- Must abide by PDPA with respect to clinical images used.
- Solution must offer adaptive learning to address the unique learning level of the learner (and the user must be able to progress in their learning from beginner to advanced at an appropriate pace).
- Solution must be able to track learner analytics, so that learners are aware of what they do not know, and measure the improvement for each user (eg pre-learning and post-learning test).
- The solution must incentivize learners to want to learn more.
- Given the space and time constraints of the targeted user (ie junior doctors with no dedicated office, and only small chunks of time during the work day), it is preferable if the solution can be accessed on mobile devices.
- If it is a mobile solution, it has to be compatible with both iOS and Android.

8. Measures of Success

1. More accurate diagnosis of skin cancers by medical students and junior doctors using dermoscopic images.

2. More timely, early diagnosis of skin cancers as doctors are able to pick up the signs of skin cancer on dermoscopy.

3. Fewer unnecessary procedures for benign lesions (as they are correctly diagnosed as non-cancerous and hence not sent for removal).

4. Higher performance scores on dermoscopy identification tests compared to non-users.

5. Post-use test scores higher than pre-use test scores (for learners who have used the solution).