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Workflow automation in immunohistochemical analysis and diagnosis - a new approach to enhancing productivity in anatomical pathology laboratory

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Introduction

Immunohistochemistry (IHC) is an essential diagnostic technology routinely used in the work up of tissue pathology and cytology samples for the diagnosis, prognosis, and therapy of a wide range of diseases, particularly in cancer patients. The growth in the number and types of IHC tests, along with the increasing workloads and reduced resources has created significant manpower and quality management challenges.

These challenges include time-consuming, error-prone manual workflow required for the operation of IHC analyzers in slide labelling, sorting and process control.

Objectives

An innovative tracking system ("Pathos") using 2D-barcode technology has previously been developed at Princess Margaret Hospital (PMH) and implemented territory-wide. The aim of the project is, through extending the system's capability to directly interfacing with equipment automatically to enhance both workflow efficiency and reliability in IHC analysis.

Methodology

An automatic equipment interface was developed and integrated to the task ordering module of Pathos to allow IHC orders directly transmitted to the control software of IHC analyzers. Such information, when combined with Pathos's unique barcodes of the submitted slides, would enable the analyzers to execute specific IHC testing procedures according to the order placed by pathologists. The workflow was simplified as manual steps including worksheet preparation, data entry to control software, sorting, logging and pre- and post-processing slide labelling were eliminated. Manpower calculation was based on 260 working days per year, and 105,720 minutes for a full-time equivalent (FTE).

Result

In the 6-month period from Aug 2017 to Jan 2018, a total of 8,607 IHC orders, which required 3 or more assay runs per day to handle, were submitted to PMH pathology laboratory. In 8,600 (99.9%) of these orders, testing requirements were directly transmitted to the IHC analyzers using the automatic equipment interface. With elimination of multiple intervening manual steps, an estimated 40 minutes per run, or

a total of 15,600 minutes were saved in the period, which would be translated to 0.3 FTE of a technical staff per year. No incidence of error due to slide mislabeling or test misidentification was found. The simplified and automatic workflow for IHC analysis thus is a very effective approach to supporting safe, consistent, and efficient laboratory operation.