

Discussion paper for Cancer Networks

The Story of MDMs and Oncology Clinical Care Information Systems

Strictly Commercial in Confidence

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1. Executive Summary

The Multi-Disciplinary Team Meeting (MDM) is emerging as an important method for improving patient safety and outcomes so that is now obligatory for good oncology practice, where it is sometimes known as the Tumour Board. Unfortunately there is little practical IT available to assist the clinician team in efficiently managing the data and processes around the MDM, and that which is available makes the crucial mistake of treating all MDMs as needing the same requirements.

This white paper identifies 5 different models in which MDMs can be conducted and the IT implications for those differences. But more importantly it identifies that the commonalities between tumour streams are insufficient to define the design of a common IT solution. Rather it points out that the differences are vital to the efficient and safe care of the patient so that the IT requirements need to firstly satisfy the differences and only subsequently exploit the commonalities.

To achieve this inversion of the IT design process we present a software development approach that can be used to build simple local solutions to MDM processing which evolve readily in time to create sophisticated solutions that integrate into the organisations surrounding full EMR, thus preventing siloing of data. The approach enables individual teams to assemble solutions to their local requirements yet ensures that global needs of the organisational IT are maintained with a single installation platform, across system analytics, and native interoperability for sharing data between different MDMs and with other institutional IT applications.

2. Introduction

In the practice of oncology across the recognized tumour streams and varied professional specialisations better communication to promote safer high quality patient care is desired. These objectives require integrated information for all the participating specialties and carers, not technical single discipline software solutions. The Multi-Disciplinary Team Meeting (MDTM or MDM or MDT or Case Conference or Tumour Board) is central to the communication and co-ordination processes and it is **the** place where clinical (history & exam from first contact specialist), investigative (radiology & pathology), and technical treatment (surgical, medical (chemo + targeted therapies) and radiotherapy) information is integrated and debated, and patient centred recommendations determined.

Only a software system that facilitates and presents this integration of data & opinion gives all participating carers the information they need about each patient to arrive at their decisions for treatment and care. Furthermore, only data and treatment summaries that support the creation of integrated care plans

will allow proper audit benchmarking and inter-unit and international comparisons. The consequence of the absence of mechanisms for creating such integrated information processing, is that each specialisation is left scratching around to compile data from multiple sources to do any meaningful audit and retrospective analyses. Additionally, without prospective data integration, the selection of patients for trials or designing trials for patients is severely inhibited. Without a proper flexible web enabled system data sharing with clinicians, academics and cancer scientists is highly inefficient if not entirely impossible and hence is one of the current major blocks to new innovative collaborative bench and translational research.

The development of clinical information systems for tertiary health institutions has led to a bias in the supply of technically based IT systems for hospital wide services, which we call Clinical Services Information Systems (CSIS) such as radiology, pathology, orders, and pharmacy. Yet there is a paucity of Clinical Care Information Systems (CCIS), that is, systems for specialised clinical care centred on individual patients. Some efforts to bridge this gap have been provided in the past by the provision of the enterprise wide clinical EMR but, although they enable collection of some clinical data, invariably they do not serve the needs of the clinical specialisations. They also almost invariably share the limitations of being incredibly expensive and difficult to install and equally difficult to change, due to their predetermination of the "right" process and data for collection.

The work processes of clinical specialists are dynamic and full of challenges which should be matched with information systems technology that can be easily reshaped every time these processes change. Large organisational wide systems that attempt to cater for every eventuality can never achieve the flexibility and dynamism and non-determinism required to support specialist work. Very significant sums of money are paid for a complex diversity of functionality that is never utilised fully and which creates an impossible encumbrance to being changed. Clinical specialisations require agile information systems that can be quickly reshaped for the changing requirements of fast paced developments and rapidly emerging initiatives in research. Whilst a large organisation needs stability in the preservation of key demographic and clinical information about patients, their clinical information requirements have to be delivered automatically or extracted from the dynamically morphing systems required by the specialties.

Large enterprise type EMR systems view the work of the specialties as a matter of data collection and uniform work processes. In reality moving from one institution to another the same specialty will normally collect the same core data but have entirely different work processes for dealing with patients and collecting that data, as well as having their own local data collection needs. *The same data may not represent the same process* so it is important for a CCIS to be readily adaptable from one institution to another and one specialty to

another, whilst maintaining the ability to completely collect a core or minimum data set for comparison purposes. Predetermined work processes are a death knell to efficient operation of a team of multi-professionals. Any CCIS has to adapt to the team needs from the outset of its installation and go on adapting as the team reshapes its way of working due to new views of professional practice, new methods of investigation and treatment, and the waxing and waning of staff membership.

In the field of oncology, some therapeutic specialisations are served by generic systems, particularly for chemotherapy with products like CHARM and for clinical/radiation oncology with in-built software for their physical equipment like Siemens' OntoQuant or MOSAIC and ARIA, which can connect to Linear Accelerators. However these systems from a technical perspective are focused on the needs of single professional disciplines. The gap left by these systems and even the combination of them with the CCIS is significant in that there is a lack of coverage of the complete patient care process. This has variable impact on different tumour stream disciplines, particularly those that are the most multi-disciplinary intensive. The current software offerings create the perspective that oncology is well served, whereas the opposite is the case. The tumour streams need to collate significant amounts of information from all of surgery, chemotherapy, pathology and radiotherapy to gain an adequate patient centric view to make decisions and advise the patient about their care. This gap in information systems is most prominent with the tumour streams that are surgery-led in their care processes, such as Breast, Colorectal, Gynaecology, Head and Neck, Skin & Melanoma, Urology, and Upper & Lower GI. The gap is further exacerbated when departmental aspects of the patient care and the collation of the various sources of information are also not catered for in the hospital EMR.

The introduction of Multi-Disciplinary Team Meetings (MDMs) for tumour streams has transformed the quality of the recommendations for care of cancer patients, but has inevitably created the need for a more patient-centric collation of data across the many disciplines and specialties involved in the care, giving a new focus on the need for CCISs for individual tumour streams. Importantly a complete MDM solution will support workflows that must:

1. Enable the ready collation of all pre-meeting data about patients including medical, imaging and pathology documentation;
2. Enable the electronic recording of all relevant activities and content during the meeting and deliver the information content and image need within the meeting for clinical investigation and interpretation; and,
3. Enable the workflow subsequent to the meeting wherein all relevant information distribution is generated as quickly and efficiently as possible.

Hence the requirements for an MDM are most usefully viewed with this

backdrop, resulting in two basic approaches to the design of MDM software systems:

1. A standalone MDM solution.
2. An MDM functionality integrated into a CCIS.

The value of specialist systems for radiation oncology, and chemotherapy is not disputed but it is a mistake to consider that they adequately serve the tumour stream departments in their management of the patient and the delivery of the MDM. This is all the more true where the medical oncologist is integrated into a surgical department devoted to an individual tumour stream, and they need to rely on a tumour specific CCIS to collect and manage their patient data.

3. The 5 Models of MDM Solutions

3.1 Model 1 – “Minutes of a Meeting” MDM Model

The standalone solution is the normal conceptualisation for MDM software. The idea is to produce a system that records the results of MDM meetings. In its simplest form, this is a process of recording the decisions of meetings in a document folder. In this sense, it is the minutes of a meeting that can be taken out of the folder at any time to be read. It has no other function than to record the proceedings of a meeting in much the same way minutes are recorded of official meetings in a minutes book or word processing file. Whilst this is simple process, it can be useful where the supply of pertinent clinical data is principally on paper.

3.2 Model 2 – The “Template” MDM Model

The Template Model treats the requirements of the MDM as uniform for all tumour streams, and so provides a single template for the recording of all MDM proceedings. This is administratively functional and serves the needs of administrative reporting without serving the full needs of clinical care. This is most readily observable by the design of the consensus data set required by a Health department.

3.3 Model 3 – The micro-CCIS MDM Model

With the presence of many information systems in tertiary care settings, it is commonplace to think of the MDM solution as being connected to these other systems for the supply of data appropriate for use in the MDM. This leads to the development of an architecture that delivers content from other systems such as pathology and radiology to the MDM system. Most commonly, this does not occur automatically so that an MDM solution is manually loaded with this precursor data making the MDM record complete once the decisions about patient care are recorded. The demand for all the precursor data to be available at the MDM creates an architecture of two parts: a miniature version of the

medical record we call the “micro-CCIS”, plus the deliberations of the meeting. This is the extent of implementation of the MDM in most organisations that we have dealt with. It arises from conceptualising the MDM as a functional unit of work that can be satisfied by a relatively independent IT solution. This model is most suited to professional communities that have only limited resources or widely distributed staff with limited access to electronic services, as might be found in a rural district.

3.4 Model 4 – The MDM-centric Model

The MDM-centric model arises from the need to provide an MDM solution in the face of a CCIS vacuum for tumour streams but with a supply of oncology technical information systems. Thus an oncology group may have access to some investigative and treatment information systems such as pathology, radiography, chemotherapy and radiotherapy but have no facility for broader client and MDM management. The difficulty in this setting is that the MDM needs access to a compilation of information from the investigative and therapy systems without copying across all of the technical content important to those disciplines. An extract needs to be provided for the MDM hence MDM software requires not only meeting management functionality but storage of the patient summary information. In this model the need for an oncology specific MDM solution takes on the role of the tumour stream specific CCIS. This might be a model that would be adopted by a cancer network as the providers and managers of the cancer care process who operate separately to the clinical departments. The MDM-centric Model is different to the micro-CCIs MDM Model in the former is seen as a not requiring an accompanying tumour stream specific CCIS and receiving data directly from all the other disciplines in the MDM, whereas the latter is smaller in ambition and scale and only serves the minimum requirements for decision making and record keeping.

3.5 Model 5 – The Functionally Integrated MDM

The functionally integrated MDM model treats the MDM as an integral part of the clinical workflow so that it is designed as a component of a larger tumour stream CCIS. In this case, the CCIS is designed to support the wide range of workflows for all the different roles of staff for the tumour stream specialisation in focus. The tumour stream defines the MDM as a natural part of its work processes and creates a different solution which is the most efficient and safest for its work processes. In this architecture, there is no one MDM solution, but a different solution for each tumour stream as embedded within its respective CCIS. A key difference between the functionally integrated model and the micro-CCIS architecture is that a greater range of processes and workflow of the tumour stream staff are built into the software solution. This solution keeps the Tumour Stream medical record fully integrated and avoids double handling by multiple systems/staff. The double-handling is almost unavoidable if not automatically delivered to the CCIS due to the crucial need for a minimum data set of patient clinical information to establish an MDM discussion, thus requiring data that can

already be recorded in a different medium (system or paper) for the micro-MDM CCIS.

4. Blending Models 3, 4 & 5 Architectures over Time

There is a significant pressure across cancer networks to “solve” the MDM processing problem, yet at the same time generally poor IT support for individual tumour stream needs. A blending of the Model 3 and Model 5 architectures can help address these issues in combination. Creating a Model 3 solution will enable a given tumour stream to create their own “minimal” CCIS requirements and get basic functionalities operational within their department. Using a technology that can provide incremental development and deployment will enable the minimal system to expand at a controlled pace into a Model 5 solution.

Model 4 can be blended with models 3 and 5 although it is not a natural fit. Model 4 arises where either the clinical department is satisfied with the services they receive from the general-purpose oncology systems or the processes of MDM support are delivered as an institutional cancer network service. If a key objective is to prevent the double and triple data entry of copying data from the other institutional sources into the MDM system then a solution that possibly commenced as a Model 3 architecture and then grew to a model 5 architecture would be a constructive strategy to adopt.

5. Not all Oncology EMRs are the same

The providers of information systems for the technical treatment specialisations of medical and radiation oncology offer additional support for importing content from other systems needed for their own specialisations, but they invariably fail to support the clinical, surgical, MDM and administrative processes of departmental teams. This lack of support becomes more pronounced when the medical oncologists are closely aligned with the tumour stream specialisations rather than just providing a service to a collection of tumour streams as they do not have access to the specialist medical oncology information systems.

There are a number of these specialist oncology information systems available in the market that are focused on identifying the common processing across tumour streams. Amongst other objectives they appeal to medical oncology as a generic discipline and so fail to support medical oncology in the context of the tumour stream in which the oncologist is practicing. The design of clinical oncology information systems is described below in the setting of two other approaches to the task of patient care management and data recording.

5.1 Level 1: Oncology EMR

Some enterprise systems offer an oncology module as an addition to their

standard EMR offering. These systems tend to be the most limited in functionality and can focus on just delivering in a slightly different way the stock and standard functions already generally available in the institutional EMR, such as a more stylised version of pathology reports.

5.2 Level 2: Oncology Information System

These systems tend to be offered by specialist suppliers, especially if they are associated with the provision of other types of oncology technology, such as Linear Accelerators. These systems offer general oncology functionalities, leaving aside the specialised functions required by individual tumour streams. Often, they will present the possibility of using templates to model particular requirements, but this process, known as customisation, only allows for limited modification of user interfaces without addressing the need for very different workflows from one installation to another. They will usually not have any effective method of handling MDMs especially with specialisation for each tumour stream.

5.3 Level 3: Oncology Clinical Care Information Systems (OCCIS)

The OCCIS has a range of features not present in the level 1 and 2 systems. It has clinical team control of all aspects of interface design, data flow and workflow. The design of these systems is managed by the clinical team to match the precise needs of their individual tumour stream and even sub-specialty. The MDM is an integrated sub-process of the complete set of clinical processes. Progressive expansion of the functionalities of the system from an MDM into a full-blown OCCIS will be in the hands of the authorised clinical team and will progress as confidence, content and budget allow. The full variety of data needed for proper care defined above as clinical, investigative, technical treatment and case administration is designed into these systems, but not to record all the technical content for each of the clinical specialties but at the correct level of summary for MDM decision making and overall treatment management and case administration.

6. iCIMS – A Single Software Solution for all Tumour Streams.

iCIMS provides a number of advantages in the support of clinical specialties across a whole health system. Its architecture enables the installation of an OCCIS for all tumour streams on a single application platform, thus creating an important efficiency in the delivery of software to the clinical point of care. The details of its functionalities are presented below.

6.1 A single Web application for all tumour streams

iCIMS is a solution of a single system wide application but at the same time enables specialised systems for each tumour stream. The iCIMS architecture enables the design of an individual MDM solution for each tumour stream at any

of the model levels described above but ***all solutions run on a single web application***. This architecture enables an organisational health system to run a single application at a central data centre and still provide each tumour stream or even each tumour stream in each hospital to have their own version of the MDM.

6.2 A single web application for all MDM models

The different models for MDM are important because they represent the different levels of willingness and ability and services that any clinical team can call on to operate their MDM. **iCIMS can support all models in the one application** and the cancer network using any one model can upgrade to another model or develop their own upgrade direction as they see fit in their own time.

Rural districts who have irregular access to pathology and radiology services, need to teleconference from multiple locations and have to negotiate with other members of their cancer network at irregular hours or asynchronously might be far better suited to the simpler model 1 of committee meeting minutes for their MDM.

A cancer network centred at a provincial hospital may be able to deliver radiology and pathology results electronically but not have a fully computerised clinical record. In which case they will need model 2 where they can load data into a template where staff can view the record at any time.

A large tertiary hospital will most likely have an EMR in some form along with electronic access to radiology and pathology records, but not have clinical specialties on electronic systems. In this case they can use model 3 where the MDM is defined in terms of incoming data from the main hospital CSIS and the minimal amount of consensus data is captured. This most often occurs where the clinical group are unwilling to adopt a full CCIS for their own operations, and might need to be cajoled into a higher level of computerised work practices.

Model 3 in turn can be upgraded to model 4 where there is full electronic delivery of all data needed in an MDM and the discussions of the MDM are recorded and drive the workflow of the members after the MDM is finished. In this setting the MDM is an intrinsic part of the workflow of all staff.

The efficiency of the iCIMS architecture supports the movement of a given organisation up through these models because of a number of its aspects, namely:

- Any implementation can be expanded and upgraded by only changing the design of the system. **No programming is needed to move from one model to another.**
- All models for all organisations across the health system can be **run in the one application on the one server.**

- The clinical teams can **develop their designs to be optimal for the constraints of their local environment *without creating siloes of data***.
- Overseeing management of all systems can be effected by creating a clinical dashboard that operates like all other CISs in its installation thus enabling **direct monitoring of all oncology specialities of the health organisation from a single point of information coalescing**.

6.3 A common underlying terminology for all tumour streams

iCIMS requires a common underlying data definition of fields using SNOMED CT to ensure that the design of the data fields is co-ordinated across all MDMs of the one specialty AND across all specialities without the need for them to have identically matched user interfaces. In this way data can be coalesced from each source knowing that fields of data are truly common to each other.

6.4 Capturing the consensus data set from everyone

Administratively the MDMs can be required to fulfil the consensus data set defined by health system authorities, while locally the iCIMS architecture provides the opportunity for the clinical specialties to design their own system to be optimised for their local processes without compromising the consensus data set.

6.5 Case Studies of different processes for the same tasks.

The importance of clinical specialty departments being able to design a CCIS to match their local constraints is vital for the technology to make an enhancement to staff productivity. Examples where the differences are important:

1. The MDM in one hospital requires pathology results to be entered prior to the meeting time while for the same tumour stream in another hospital only a discussion of the results is recorded in the MDM and the test details entered into the clinical record later.
2. In one MDM the patient case is presented before any clinical care is decided on and in another of the same specialty the surgery is completed before the patient case is presented to the MDM.
3. In a familial cancer MDM it is important to have all the results of all testing and treatments before the advice for the patient is determined, so this is done late in the health episode of the patient whereas treatment centred specialties need to meet and act quickly when the patient first attends.
4. At one MDM with 30-40 patients, the MDM workflow design has a panel where each staff role that is allocated a task is ticked off and that task is added to their electronic work list. In another hospital with 10 cases per meeting this is not warranted as it is considered important for each staff member to review every case for their post-meeting care needs.

5. At one MDM the patient's diagnosis is determined at the MDM as a group decision and recorded as part of the MDM outcomes, while at another of the same speciality the diagnosis is kept as an entirely exclusive process that just pre-fills into the MDM as a historical record.
6. In one clinical oncology speciality, the patient's pathology and surgical findings are grouped and recorded collectively under a single concept (e.g. Prognostic Factors) to enter and view as a combined summary. In a different setting of the same speciality, the data capture and retrieval are required exclusively for each, surgical findings and pathological findings. In both instances, the data dictionary is still the same.
7. Different tumour streams need to capture specific outcomes/decisions at the point of the MDM that do not necessarily apply to other tumour streams. For instance, a Breast Cancer MDM in one setting records the patient's eligibility for a "Breast Survivorship" program which is usually determined at the MDM.

7. In Summary

An advanced objective an MDM solution needs to be part of complete tumour stream information system to both give it the maximum data needed in the meetings and for its outcomes to be optimally integrated into the tumour stream workflow. A CCIS can begin as an MDM-centric installation for the purposes of getting the processes started, but the initial installation should be designed so that it can readily expand and evolve as the clinical community wishes to increase the level of IT support for their workflow processes.

