# Foresight instead of hindsight: An ideal model for designing an Electronic Health Record System for contemporary occupational therapy practice

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## ABBREVIATIONS

| | |
|---|---|
| CGM | Centralised Gear Model |
| EBP | Evidence Based Practice |
| EMR | Electronic Medical Record |
| EHR | Electronic Health Record |
| ICT | Information Communication Technology |
| LHD | Local Health District |
| LGM | Linear Gear Model |
| MNCLHD | Mid North Coast Local Health District |
| NNSWLHD | Northern NSW Local Health District |
| OT | Occupational Therapy |
| OTs | Occupational Therapists |

# ABSTRACT

## Introduction

In the Northern NSW Local Health District (NNSWLHD) and the Mid North Coast Local Health District (MNCLHD), clinical occupational therapists (OTs) are currently using a mix of electronic and paper based systems for clinical information management. This study aims to review the current clinical information management systems utilised by OTs, and postulate a model which outlines the features of an ideal universal Electronic Health Record (EHR) System that complements current electronic medical record (EMR) systems to meet the evolving needs of contemporary occupational therapy (OT) practice.

## Method

A qualitative study framework using appreciative inquiry methodology was selected for this study. Three focus groups were conducted with twelve clinical OTs working in multiple sites across NNSWLHD and MNCLHD. Transcripts of these focus groups were manually coded and analysed to identify shared ideas and common themes.

## Results

Abstracted from the response of the study participants, current OT clinical information recording and sharing systems are found to be working in a hypothesised linear gear model (LGM). The LGM systems are more advanced than conventional paper based systems as it offers greater reliability of information delivery, easier access to medical information and better monitoring of clinical activity levels. Nevertheless, it would benefit of further upgrade to address the needs for evidence-based and client-centred practice for contemporary OT practice. Based on the suggestions provided by the participants, an ideal universal EHR system designed in a hypothesised centralised gear model (CGM) is likely to bring numerous benefits to clinicians, patients and LHDs although it is still unclear how to address the technical, resource and confidentiality barriers for the development of an EHR system.

## Discussion

The findings of this study suggest an upgrade of the current medical information record system of LGM to a health information record system of CGM to improve the accessibility to comprehensive health information including environmental and functional information for clinical OTs across all settings. It is important for policy makers and program developers to take into account of the CGM when upgrades current EMR systems to better address OTs' clinical needs. Further studies to test and validate the hypothesised CGM for its impact on OTs and across a multidisciplinary team will be required. Future research to extend the findings to include the opinion of OTs working in other rural and metropolitan areas will better reflect the collective views of the broader OT community regarding this topic.



## Keywords

Occupational therapy, Electronic Health Record, clinical information management, contemporary occupational therapy practice, efficiency improvement

# EXECUTIVE SUMMARY

This study reviews the current clinical information recording and sharing system used by clinical occupational therapists (OTs) across different practice settings within the Northern NSW Local Health District (NNSWLHD) and Mid North Coast Local Health District (MNCLHD). The two principle research questions are: 1. What is the current OT clinical information record system? 2. What is an ideal state of a clinical information record system for contemporary OT practice?

## The Research

A qualitative appreciative inquiry study design was adapted to investigate the two research questions. Ideas gathered from three focus groups conducted with twelve OTs from various work sites across NNSWLHD and MNCLHD have been summarized and analysed to form a clear understanding of how do clinical OTs perceive current EMR systems and how to further improve the quality and efficiency of OT health information management in the current systems, to meet the increasing demands for contemporary evidence-based and client-centred OT practice.

## Findings

### The Linear Gear Model System

At present, clinical OTs are using a combination of paper and electronic methods to record and share clinical information between different health services (figure1). The flow of clinical information can be described as a linear gear model (LGM), where the information flow is linear, sequential and primarily individual driven. The LGM system has advantages in convenience and reliability when compared with the traditional paper-based only system. The LGM system incorporates the use of a variety of existing information communication technology (ICT) such as work e-mail, document scanning, and most importantly electronic medical record (EMR) systems, which facilitates an easier access and sharing of patients' clinical information.

### The Areas to Improve for the LGM System

There is no universal approach for clinical OTs to share clinical information in the current LGM system. The participant profile survey shows that nearly all the participating OTs (91%) reported some level of dissatisfaction with this hybrid system they are presently using in their routine practice. the majority of participating OTs still rely on traditional paper-based methods and have varying skill levels relating to the use of supplementary ICT systems dependent upon on the availability of technological infrastructure and ICT support. The majority of OTs (83.3%) in this study were neutral or agreed that they felt confident with the use of existing electronic systems for clinical information sharing purposes. However, two thirds of the OTs (66.7%) in this study did not feel satisfied with their user experience of these electronic systems. The above results indicate a significant need to further improve the current information sharing system to meet the needs of OT clinical practice.

All EMR systems used by the OTs in this study operate with individual databases and only allow exclusive access for authorised clinicians who have registered user accounts with relevant system. Therefore authorised clinicians are required to work as an agency to facilitate the share of the health information to the clinicians who are unable to access the databases. In clinical practice, patients are often transferred between facilities for a myriad of reasons, requiring handover of clinical information for continuing care. Further improvement of reliability and efficiency for information sharing system is likely to minimize the delays in the transfer of a patient's clinical record and result in unnecessary

duplication of information gathering processes. For patients living in rural areas presenting with complex medical needs, processes of obtaining and clarifying health related information, as well as identifying and liaising with carers and services are even more labour intensive and time consuming. Therefore they might greatly benefit from the improvement of streamlining the clinical information sharing process.

In summary, following areas are considered essential to improve the current clinical information sharing and recording systems: 1) to overcome the limitation of traditional methods for information sharing 2) to streamline the person driven process. 3) to introduce a universal and standardized pathway 4) to improve the infrastructural and ICT support for the electronic systems 5) to overcome the limitation of current EMR systems

### The Centralised Gear Model System

Following completion of data analysis, this research proposes a more suitable term 'health information record' to replace the 'medical information record' or 'clinical information record' to more accurately describe the features of a comprehensive, integrated and centralised database system for utilising in optimized OT clinical service. Based on the analysis of the response from the study participants, a hypothesised centralised gear model (CGM) is envisioned to outline the desirable features, potential benefits and possible future barriers to developing an ideal Electronic Health Record System designed to support contemporary OT clinical practice.

**Desirable Features**

1) auto-generated discharge summaries and clinical activity reports 2) links to evidence based practice resources
3) integrated and centralised database with full log of past and present clinical activities 4) a universal system interface with a user friendly navigation module 4) ability to upload electronic information in multiple formats

**Potential Benefits**

For Clinicians: 1) minimize duplication 2) reduce demand on administrative tasks 3) improved clinical decision making 4) improved implementation of EBP

For Patients: 1) better quality of clinical care 2) improved continuity of care 3) elimination of repetitive information gathering processes

For Local Health Districts: 1) cost saving 2) reduced risk of clinical incidents 3) more accurate and thorough service performance information

**Possible Future Barriers:**

Barriers to the development and application of the hypothesised system may include:
1) availability of funding and resources 2) practical technological execution of the desirable features 3) setup of a reliable back-up system 4)acceptance from patients and OTs to utilising ICT 5)protection of patient confidentiality within a shared database

## Conclusions and Recommendations

When compared with the traditional paper-based system, the integration of EMRs and other ICT systems into occupational therapy (OT) clinical practice are perceived to have significant advantages. The current EMRs could be further improved by not only sharing medical information, but comprehensive health information to address the needs of OTs to obtain patients' environmental and functional information for optimal clinical decision making. An upgrade of

current EMRs from Linear Gear Model to Centralized Gear Model to form a universal Electronic Health Record System is highly desirable for OTs to meet the contemporary OT practice requirements of evidence-based and client-centred practice. The CGM system is also believed to be able to bring numerous benefits to the patient and the LHDs, although further study is required to investigate how the technical and financial barriers relating to the implementation of an EHR system designed based on the CGM may be addressed.

The recommendations arising from this study are:

- upgrade or redesign of current electronic medical record (EMR) systems to form a universal electronic health record system designed based of the centralised gear model.
- allocate more resources to support the development and trial of an electronic health information record system.
- consult with OTs and appoint representative OTs with clear understanding and insight of the contemporary OT needs to the relevant working committee prior to any major system changes on current EMR systems
- ongoing review of the efficiency and efficacy of EMR systems in meeting the needs of contemporary OT practice.

# INTRODUCTON

Australians living in rural areas are significantly disadvantaged, as compared to their metropolitan counterparts, in terms of accessing occupational therapy (OT) services due to the longer travel distances to health facilities, lack of accessible public transportation and insufficient number of clinical staff employed by rural facilities (Bourke, 2001; Mills & Millsteed, 2002). In the current national financial climate where the health budget is being continuously tightened and availability of funding is grossly limited, developing strategies to maximise therapists' clinical efficiency whilst ensuring consistency in the delivery of OT services so as to meet the ever growing demand is a rising challenge for all health managers and local health districts.

The key element for OT's clinical practice efficiency is the time OTs spent in accessing to comprehensive clinical information and the quality of the clinical information gathered for making clinical decisions. Therefore, if the time spent for gathering clinical information is minimized and the quality of the information is optimized, the overall efficiency of the OT practice will undoubtedly enhanced.

Occupational therapist (OTs) in the Northern New South Wales Local Health District (NNSWLHD) and Mid North Coast Health District (MNCLHD) are currently using a hybrid system combining paper-based and electronic methods to record and share clinical information in their daily practice. With the introduction of electronic medical record (EMR) systems, it is envisioned that clinicians could have easier access to shared medical information and be alleviated from the increasing demands of completing necessary administrative tasks of the paper system to access to desired clinical information

Though it is widely believed that OTs would, in theory, benefit from the use of the EMR systems, little is known at present about OTs' actual experience of utilising current clinical information recording and sharing systems and their perception of the extent to which their needs in clinical information management are being met. This study aims to investigate the perceived benefits and areas for improvement of current EMR systems, and explores how to further enhance the usefulness of the system to better address the needs for contemporary OT practice.

# BACKGROUND

## Accessing OT Service in Rural Area

Australians living in rural or regional areas are facing significant difficulties in accessing OT services due to staff shortage and geographic isolation. They are significantly disadvantaged in terms of accessing health services due to the long distances needed to travel to services and the lack of transportation (Bourke, 2001; Mills & Millsteed, 2002). In addition, recruiting and retaining health professionals in rural and remote areas are also increasingly challenging (Bourke, 2001; Mills & Millsteed, 2002). A national demographic report suggests NSW has 39% of its population living in regional/remote areas. However, only 21% of allied health workforce and 24% of OTs are serving those areas (Services for Australian Rural and Remote Allied Health, 2003).

This inadequacy of supply impacts OTs themselves. OT practitioners experience multiple challenges when practicing in rural areas (Mills & Millsteed, 2002) as they are unable to share their caseload with other therapists due to staff

shortages; their caseload can cover a vast geographical area; and the number of people who could benefit from OT services often exceeds therapists' workload capacity.

## The Requirements of Contemporary Clinical OT Practice

### The Concept of OT

"Occupational therapy is a client-centred health profession concerned with promoting health and wellbeing through occupation. The primary goal of occupational therapy is to enable people to participate in the activities of everyday life. Occupational therapists achieve this outcome by working with people and communities to enhance their ability to engage in the occupations they want to, need to, or are expected to do, or by modifying the occupation or the environment to better support their occupational engagement." (World Federation of Occupational Therapists, 2012)

### Evidence-Based Practice

With 2017 marked as the centennial year of the OT profession, American Occupational Therapy Association 's latest vision statement describes OT as "a powerful, widely recognised, science-driven, and evidence-based profession with a globally connected and diverse workforce meeting society's occupational needs". O'Brien & Sabonis-Chafee (2012) concluded that this vision for the OT profession emphasises the progressive shift towards evidence-based practice (EBP) and highlights the value of the diverse nature of clients and practitioners. Contemporary OT practice demands that OTs ensure their practice is based on rigorous evidence. Evidence-based practice is an approach to clinical decision making that requires OTs to critically appraise patients' individual conditions with relevant clinical questions by referring to current valid best research evidence (Bennett, S. & Bennett J.W., 2000).

In NSW, the LHDs have put enormous effort toward facilitating clinicians' access to evidence-based clinical resources and professional training to optimise the implementation of EBP. However apart from the competency of the individual clinicians, the key factor of making a sound clinical decision under the EBP framework is actually the ability and efficiency to acquire accurate and comprehensive clinical information regarding the individual's personal, occupational and environmental circumstance. Most of the time, this could be influenced by the specific clinical expertise and characteristics of each OT service within the myriad of clinical settings that each individual patient may encounter throughout their treatment journey. A vital component of EBP lies in the efficient and timely communication of patient information between all clinicians involved in an individual's care. It is essential that the latest clinical information is accurate, comprehensive and able to be shared to form a complete clinical picture and an understanding of the individual's unique circumstance and facilitate the timely engagement of all involved clinicians. Moreover, in clinical practice, OTs are the only health professionals to provide assessment and recommendations for modifications to individuals' home environments according to their needs for safety and functionality. The contemporary requirement of EBP requires OTs to not only collect and share the conventional forms of written information but also to utilise multimedia such as photos and videos to provide information demonstrating individuals' functional and environmental needs.

### Client-Centred Practice

As Law et al. (1995, pp.250-257) described, the client-centred practice approach 'is a philosophy of practice built on concepts that reflect changes in the attitudes and beliefs of clients and OTs. These attitudes and beliefs include the notion that clients need to express their needs and to make choices regarding their occupations, roles, interests, environments, and culture which are central to the occupational therapy process.'

An essential part of client-centred practice is the need for OTs to facilitate the transition of services in order to prepare the client to progress to a new functional level, environment or life stage (O'Brien, & Sabonis-Chafee, 2012). Occupational Therapists are involved in identifying suitable services and developing an individualised transition plan to facilitate clients' progress from one clinical practice setting to another. Similar to the requirements for EBP, client-centred contemporary OT practice emphasises the importance of sharing client related health information between OTs and other clinicians in different services to optimise the continuity of care. The need for OTs to address an individual's occupational and functional needs within their unique cultural and environmental context necessitates that a substantial amount of non-medical information to be included when any service transition occurs and has become an essential administrative task in contemporary OT practice.

## OT and Electronic Medical Record Systems

Information and communication technology (ICT) has evolved dramatically in the last decade, enabling the continuous sharing of enormous amounts of personal and work related information through various online platforms such as Facebook, LinkedIn and Microsoft Outlook, and not just limited to the desktop computer or laptop, but also through use of portable devices such as smart phones and tablets. This proliferation in the functionalities and use of ICTs is still limited within the healthcare system, which is moving very slowly towards the use of ICT to manage clinical information.

### OT and Electronic Medical Record Systems in NSW Australia

In recent years EMR systems have been widely used in clinical services within all LHDs but unfortunately, the majority of OTs and other clinicians working in the NSW public health system appear to still rely heavily on conventional information sharing methods such as postal services, facsimile, and phone calls when making handovers and referrals.

This section will review major EMR systems that are listed on the NSW Health website (www.health.nsw.gov.au/). There are a number of other EMR systems used by NSW Health but on a smaller scale or only in specific facilities. These individual systems have been excluded in this review.

#### Cerner Electronic Medical Record

The *Cerner*® electronic medical record (eMR) system (New South Wales Health Department, 2013b) has been introduced to acute hospitals since 2007. Occupational Therapists practicing in hospital settings are authorized to access medical information via eMR with a valid user account. Hospital OTs generally utilise the PowerChart module to process referrals, access electronic medical and nursing notes and discharge summaries as well as review medical imaging and laboratory test results. FirstNet is another module within eMR which allows OTs working in Emergency Departments to obtain live updates relating to patient movement and intervention planning, enter electronic progress notes using existing templates or free-text functions, and review progress entries made by medical and other allied health staff.

NSW Health (2013b) has announced a proposed further upgrade of the eMR to the second phase, which is called eMR2. The eMR2 has the potential to assist hospital OTs in clinical decision making through the introduction of hospital wide use of electronic clinical progress notes and electronic risk assessments. It may also benefit the management of acute OT services and regulate access to funding through the use of automated activity reporting and capacity to create user-specific activity reports.

### Electronic Age Care Client Record

The Department of Human Services has been working closely with the Department of Health and Ageing and regional Aged Care Assessment Teams (ACATs) on the electronic Aged Care Client Record (eACCR) project (Australian Department of Human Services, 2012). Currently, ACATs are able to electronically lodge aged care client records to the Department of Human Services for processing within the aged care payment systems via the Aged Care Evaluation (ACE) system. Transitional Aged Care Service (TACS) clinicians also use the same database and ACE system to generate clinical outcome measure reports and complete relevant administrative tasks for their community clients. Only authorised OTs with a valid user account are able to view relevant records to verify a care recipient's approval status and related Aged Care Assessment reports.

### Community Health and Outpatient Care (CHOC)

The Community Health and Outpatient Care (CHOC) Program is a state-wide program which will form an important addition to the current eMR system and aims to deliver the Integrated Clinical System (ICS) to support community based health services (New South Wales Health Department, 2012a). The CHOC solution will be part of the *Cerner*® system, and provide clinicians with electronic access to community patients' discharge summaries and clinical handover information, results of health assessments conducted in community settings, and administrative components to manage referrals, wait lists and appointment scheduling. The aim of CHOC is to improve access to clinical information across in all LHDs by adding functionality to the electronic medical record (eMR),

### HealtheNnet

As part of the National eHealth Record (NeHR) reform, the HealtheNet program has been introduced in some metropolitan areas in Sydney to improve the provision of health care to those LHD residents (New South Wales Health Department, 2012c). The HealtheNet system is planning to integrate into the Personally Controlled Electronic Health Record (PCEHR) and it is believed that benefits to patients and health professionals including OTs will include improving information sharing between hospitals, community health, general practitioners (GPs), other private providers and consumers.

The eDischarge Summary is its signature feature as it enables the sharing of patients' hospital discharge summaries electronically between GPs and hospital systems. The Clinical Portal could benefit patients and health professionals by improving information sharing as clinicians including OTs can use this function to view 'additional information' about a patient they may not otherwise have access to within their existing systems.

The Features of above EMRs are summarized in Table 1 below :

| Table 1 | SUMMARY OF THE FEATURES OF EMRS IN NSW AUSTRALIA | | | |
|---|---|---|---|---|
| | **eMR/eMR2** | **eACCR** | **CHOC** | **HealtheNet** |
| **Currently in use** | ✓ | ✓ | ✘ | ✘ |
| | eMR2 to roll out in 2015 | | Still under development | Still under development |
| **User group** | Mainly for OTs in acute | Only for OTs in sub-acute | Only for OTs in | All clinical OTs |

| | | | | |
|---|---|---|---|---|
| | settings | and community settings (ACAT) | community settings | |
| **Access by all clinical OTs** | ✗ | ✗ | ✗ | ✓ |
| **Ability for OTs to upload information** | ✗ but eMR2 would enable electronic documentation | ✓ | ✓ | Unsure |
| **Ability to upload photographic information** | ✗ | ✗ | Unsure but not likely | Unsure but not likely |
| **Access database across LHDs** | ✗ | ✗ | Unsure | Unsure but likely |
| **Specially designed information sharing component for OTs** | ✗ | ✗ | ✗ | ✗ |

### OTs and Current EMRs

Occupational Therapists are required to collect and share large amounts of clinical information in their routine practice. Although there are numerous EMR systems being used in current OT practice, as illustrated in the previous section, the extent to which OT service has been improved and how to further improve by current advances in ICT development in medical information sharing is rarely studied.

A search of current literature was conducted on various medical databases including Medline, OT seeker and CINAHL using both keywords and mesh terms relating to 'Occupational Therapy' and 'electronic health(medical) record(s)'. Unfortunately, none of the results yielded were explicitly relevant, as most of the current literature related to the application of telehealth and focused on its usefulness and effectiveness in the provision of OT assessments and interventions. There is no current literature investigating the relationship between EMR and OT practice or how OT practice may benefit through the use of current EMR systems. It is intentional that the literature review does not include studies which investigate the relationship between EMR or EHR and other health discipline as they do not provide a direct insight of how OTs needs are met by the EMR systems.

A secondary extended research on how OT practice may benefit through the use of EMRs was conducted on a public search engine i.e. Google Search. The results yielded private company products that claim to be suitable for OT clinical use in clinical practice. As an illustration, American Occupational Therapy Association (AOTA) and Cedaron Medical Inc. (Cedaron Medical Inc, 2012) have developed a system to provide templates for documenting client assessments, interventions, and outcomes specific to OT practice. The system is also reported to be compatible with modules designed for other health professionals to build a universal electronic platform.

In conclusion, although there are some online product descriptions available to illustrate relevant features and claimed

usefulness of an EMR system relevant to OT practice, there is currently no peer reviewed literature documenting evidence of what OTs need from current EMRs and how current EMRs are impacting on contemporary OT practice.

### OTs and ideal EMR

Amongst the results from previous research, there are some studies that briefly examined what could be the desirable features, potential benefits and likely barriers of electronic medical record use in clinical OT practice. Relevant information is summarised and listed below:

Brewin (2002) stated her expert opinion on what could be the desirable features for an electronic health record system. From her perspective as an OT, she outlined the following list of potential functions which should be included when developing the system:

- data of patient contacts to review total treatment episode and produce patient progress and discharge reports
- monitoring interventions outcomes and service effectiveness for service evaluation and planning purposes
- evaluation of interventions in terms of the implementation of EBP practice and for research and service development purposes

Nevertheless, Brewin (2002) did not explain how and why these features could be particularly important and applicable to contemporary OT practice, especially for various OT settings. Therefore further investigation to examine and validate her findings with clinical OTs is required to form a better understanding of their needs from electronic health information record system.

In a reflective article, Arabit (2010) suggested following potential opportunities for OT service and profession to encourage and prepare OTs for the introduction of an electronic documentation system:

- increase knowledge and awareness of OT by other professionals
- improve efficiency in data entry
- reduce errors in charting
- improve patient safety by better communication within the treating team
- potential to increase revenue; increase potential for obtaining outcome study measure

However Arabit's (2010) opinions are mainly focusing on the benefit from the data entry level of the EMR and still inadequately illustrate how the information sharing process could be benefited by the proposed system. Moreover, the benefits from the electronic documentation system mentioned in his article are likely to be applicable only to the acute setting and may not be transferrable to all clinical areas of current OT practice. For this reason it will be essential to expand the understanding of the benefits of EMR from mainly acute hospital setting to other clinical OT practice areas.

Arabit (2010) also outlined the following barriers which could arise when an EMR is used in OT practice:

- anxiety and resistance of the staff
- resources and time required for training staff
- extensive time needed for developing and implementing the system
- staff's various level of computer skills
- computer down time and unavailability of technical support
- the potential for privacy breaches

Arabit's opinions are supported by Chedid et al.'s (2013) study on the barriers for ICT to be used by OTs in rural NSW. Chedid et al. (2013) suggested the concurrent individual (age, ICT knowledge and preferences), work place (ICT support & training, availability of resources) and community factors (infrastructural, client acceptance) are accounted for the major barriers for ICT system including EMR to be implemented and assist OT in their clinical practice. This is similar to the findings of Schaper & Pervan (2007)'s study on factors influencing the acceptance and utilization of ICT for OTs. It is important to point out that Chedid et al. (2013)'s study suggested that the individual acceptance of the use of ICT is no longer a main barrier, as an extension of Schaper & Pervan (2007)'s study.

### The Research Questions

To sum up, in NSW although there are a variety of electronic medical record systems using by clinical OTs, there is not a system that is accessible by all clinical OTs or has specially designed component for OT practice. It is also not known to OTs that how current EMR systems are impacting on their clinical practice and what could be an ideal state of an EMR that could be upgraded or formed from current system(s). Therefore, two research questions are used to investigate the potential of how to further upgrade current EMRs to an ideal status to assist contemporary OT practice: 1. What is the current OT clinical information record system? 2. What is an ideal state of a clinical information record system for contemporary OT practice?

## METHOD

### Ethical Approval

Ethical approvals were granted by the North Coast NSW Human Research Ethics Committee as low and negligible risk research (LNR No.068) and Site Specific Approvals were granted by NNSWLHD (LNR G195) and MNCLHD (LNRSSA/14/NCC/21).

### Study Design

This qualitative study adapts appreciative inquiry as the methodology to frame the study design. This methodology focuses on the strengths of the current situations and envisions the future for the benefit of the group. Participants work collectively to design plans for the future and explore what needs to happen to realise the desirable changes from an organisational perspective (Trajkovski et.al, 2013). This study examines the current system of clinical information sharing between OTs from different clinical settings, and discovers study participants' perceptions as to how to achieve a more efficient system with desirable improvements.

### Research Population

All clinical OTs working in NNSWLHD and MNCLHD

#### Inclusion Criteria

- Must be currently practicing as a clinician or has recent clinical practice experience in last 24 months,
- Experience or knowledge in using an electronic medical record system within 24 months.
- Routinely required to share patient information with OTs practicing in other clinical sectors.

#### Exclusion Criteria

- OTs practicing in a non-clinical role such as health service coordinator or clinical educator.
- Seldom or rarely required to share patient information with other OTs practicing in a different clinical sector.

## Methodology

### Sampling strategy

- Purposeful sampling was used to select participants according to the inclusion/exclusion criteria. Invitations were sent to all clinical OTs and final focus group participants were purposefully chosen amongst all potential candidates in order to maximize variation of representative for different caseload in each focus group.
- In addition, senior staffs of each clinical caseload of the three LHDs were considered priority for recruitment for focus groups as they likely could provide a deeper insight into the topic due to their advanced clinical experience.

### Recruitment and Participants

All potential participants were invited to participate in the research by distributed emails sent from the principal researcher via the OT department managers of the two LHDs. Twelve potential participants indicated their willingness to participate and were then provided with a package consists of consent form, demographic questionnaire and participant information sheet outlining the purpose and details of the study. They were followed up with a confirmation phone call to identify availability and provide details of the focus group meeting. All written consent was received either via mail or in person at attendance of a focus group. Each individual focus group consisted of OTs from more than one practice setting. Appendix 2 presents the participants' demographic information gathered by the demographic questionnaire (Appendix 3). Comparison is made to the Western Australia OT labour force survey in 2007, which is the only latest available guideline to include the tiers of age, education level and practice settings.

### Data Collection

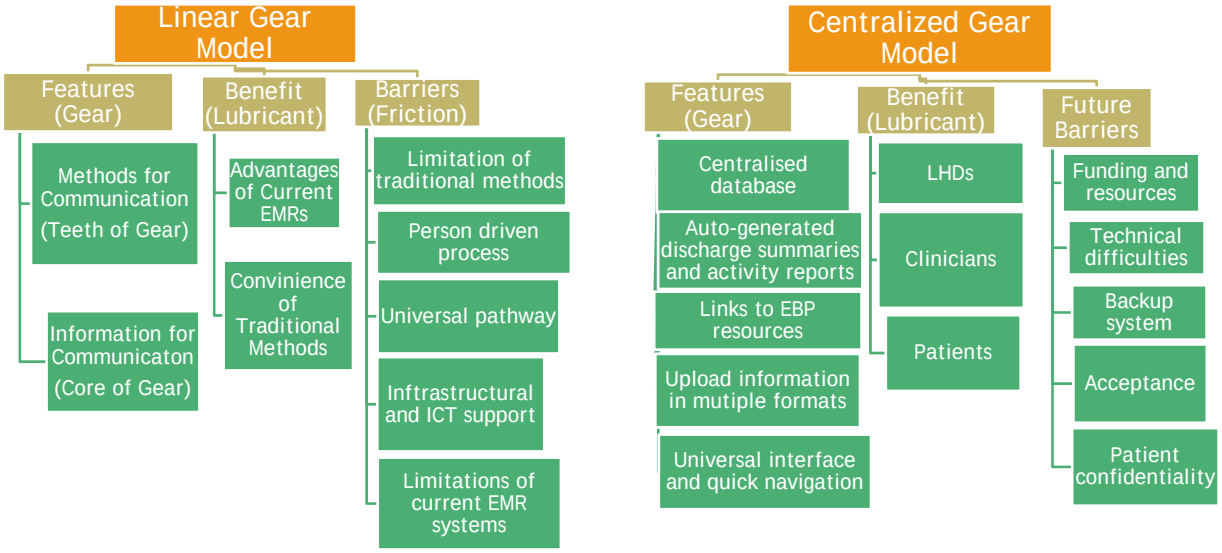
The focus group approach was adapted with the aim of obtaining data to address the principal research question and collect common ideas shared by the participants (Hancock, 2000). The role of the principle researcher in the focus group was a moderator to facilitate the discussion between group participants (Rice & Ezzy, 1999). Three focus groups were conducted by the principal researcher in a semi-structured format with the predetermined guiding questions list (Appendix 1). The principle researcher was the sole coordinator of the focus groups and no other personnel was involved in conducting the focus group or recording data. Field notes were taken by principal researcher during the focus groups and used to assist the data analysis process. All focus groups were digitally recorded with backup digital devices to ensure the quality of data collection. All 12 participants signed the written consent form. The focus groups conducted on site in Tweed (n=5) and Lismore (n=3) were in face to face format. The group conducted in Coffs Harbour (n=4) hospital was via videoconference in the videoconference room due to logistic reasons. All audio data was captured by using RecordPad v4.18 (NCH software) of the research's laptop and sound quality enhanced by a USB professional microphone device attached to the working laptop. Focus group sessions (including introduction and mid-way break) lasted between 95 and 105 minutes. The actual discussion recording lasted between 66 and 77 minutes. No participant dropped out of the study or refused to participate after individual consent was received.

### Data Analysis

- All audio recordings from the focus groups were manually transcribed by the principal researcher using the RecordPad software. All audio data transcription was assisted by the voice speed adjustment and repeat/fastforward/fastback function of the software to ensure all sentences were recorded correctly. Unclear

sentences were noted and received validation from a specific OT colleague (research participant). However no participant was available to review the final transcript due to the constraint of individual availability. Transcripts then were transferred to Microsoft Excel spreadsheet for further analysis.

- Transcripts from interviews and focus groups were analysed through a process of thematic analysis. All data were coded and classified into specific themes that emerged through the analytical process (Hancock, 2000). Each transcript was read and information that appeared to be interesting or relevant to the research question was noted and coded according to the code book developed during this process. Field notes were used to assist the transcription and identification of the emerging themes.
- Each response is first summarised into a first layer summary for abstracting main ideas and then analysed to a second layer level with implied ideas and attitude. Multiple minor themes were generated based on the trends of the first and second layer analysis. Three main frames were concluded from the codes regarding the features of current/ideal EMRs (the Gear), the benefits of current/ideal EMRs (Lubricant) and the barriers of current/future EMRs (Friction).
- Two models were subsequently derived from the emerged themes to outline both the current OT clinical information record and sharing system (Linear Gear Model) and the desirable future upgrade version (Centralized Gear Model).
- The relationship between the codes for the subthemes, the major themes and the model developed during the analysis process is illustrated as the following diagrams:




## RESULTS

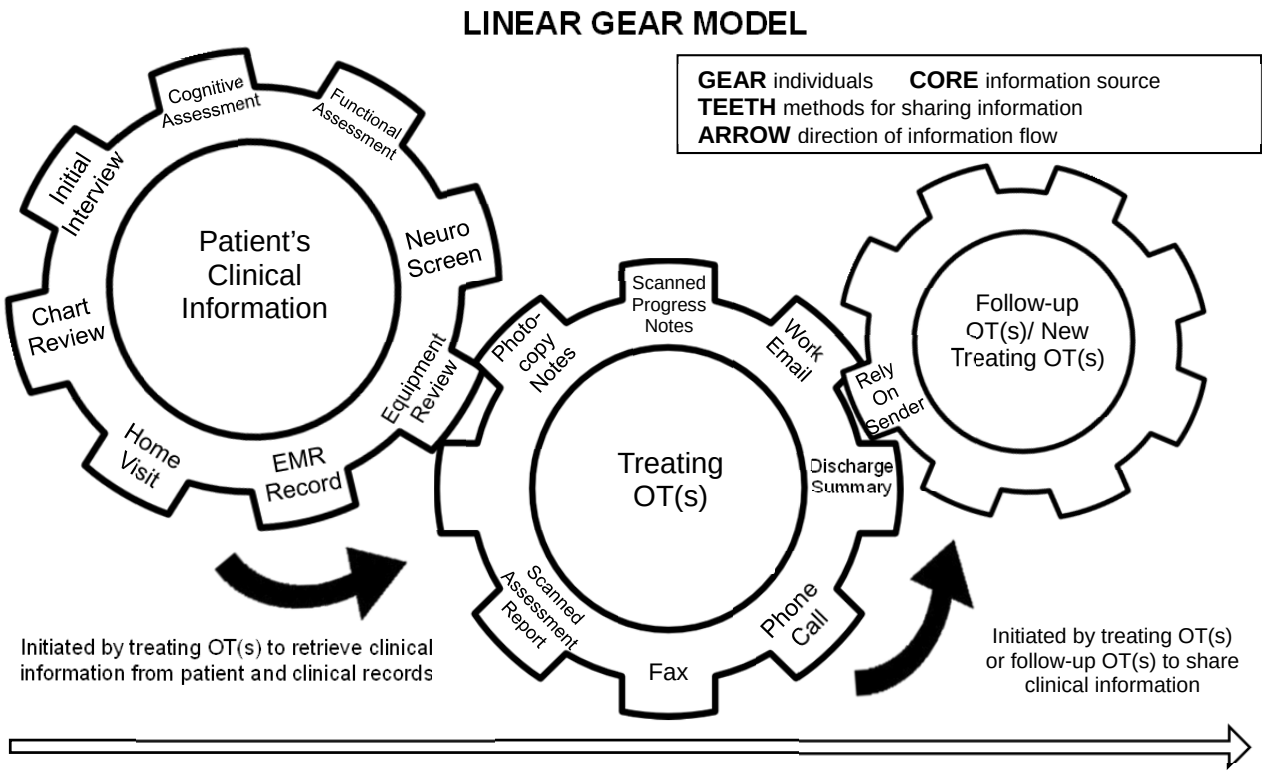
The analysis of the participant responses were summarised into two original models that are introduced in this study, which is in line with the Appreciative Inquiry methodology used to address the two research questions of: 1.What is the current OT clinical information record system? 2. What is an ideal state of a clinical information record system for contemporary OT practice? Themes emerged from the responses under these two models are presented as Figure 1 and Figure 2.

## Research Question 1: What is the current OT clinical information record system?

### The Linear Gear Model

Based on the responses of the participants, the pathway and methods of collecting and sharing clinical information is summarised as the Linear Gear Model (LGM), demonstrated in Figure 1 below. Currently the clinical information sharing between clinical OTs of different practice settings in NNSWLHD and MNCLHD is via a combined electronic and paper-based approach and follows a linear and sequential direction from sender to receiver.

**FIGURE 1:** *Outline of the Linear Gear Model*




### Advantages of the Lineal Gear Model, the lubricant

When discussing the advantages of the current LGM system, participants were in agreement with a number of areas. These findings were categorised into the following minor themes:

- the convenience of traditional methods
- the advantages of the current electronic systems

### The Convenience of Traditional Methods

Due to the fact that clinical documents are still mainly stored in hard copy form, and paper based communication technologies are widely available and known to everyone, some OTs found these traditional methods convenient and useful.

> *"I just find that at the moment it is still the easiest way to get that information (via fax) rather than just go through the emails."* OT in inpatient rehab

For the services using a combination of both electronic and traditional paper based system of clinical information recording, it is believed that the paper form record is valuable as a legal document in case clinical incident occurred.

> *"I think there is the only way for keeping our head above water from clinical incidents, quite often with the dual system at the moment."* OT department manager

### The Advantages of Current Electronic Systems

Participants in the study choose to use various ICT made available to them, in conjunction with paper-based systems. The technology employed by OTs includes email, scanning paper documents and the eMR.

#### *Work Email*

Majority of participants expressed their preference of using work e-mail for making or receiving referrals and hand-overs instead of via phone calls or faxing.

With the reader receipt function of the work e-mail, sender could track the delivery status of the e-mail to ensure the information reaches the receiver end. This is a highly desirable feature to increase the level of confidence from a sender's perspective. Particularly for the OTs in acute setting, the efficiency of communication is invaluable to meet the high demand of the faster turn-over caseload and tight timelines.

> *"And the fact that you can see when someone has opened it and I have used that so often…"*OT in acute hospital

The latest model of multi-function printers in hospitals has a feature of converting scanned document into PDF format and sending to user's designated e-mail address. The PDF document could subsequently be distributed and attached in an e-mail. This feature provides convenience for turning hard copy information into electronic form to enhance its accessibility to authorized clinicians.

> *"At the moment, we are getting a variety of information. We are getting scanned progress notes...that is often sent as an email to everybody"* OT in in-patient rehab

#### *EMR systems*

Most participants found that using eMR to accept electronic referrals and access medical information when patients are in hospital is very helpful.

> *"I could access (the) electronic medical record and have a look at the information from the medical point of view and discharge summaries, admissions in ED stuff."* OT in acute setting

Study participants described the eMR as not only helping OTs in acute settings but also for community OTs to obtain an individual's latest medical information from the ED notes or operation reports. With the additional medical information, it aids the OTs to optimise their prioritisation and allocation of human resources, especially for the acute caseload.

*"I have found that helpful, I think I can access information otherwise I have to walk down to get a file down to the wards or go to medical records… For me it is a lot easier, and particularly when we get community OT referrals..."* OT in community setting

*"I find it very useful. It is very useful for acute because we could work off priority in allocation to such amount, just time saving...*" OT in acute setting

At the same time, from the management point of view, eMR is able to be used to monitor the acute OT department performance by generating activity and department performance report.

*"You get to see how long a referral has been waiting for, whether there has been a delay when it occurs…"* From OT department manager

### The Area to Improve in the Lineal Gear Model, the frictions

When discussing the area to improve for the current LGM system, baseline measures are conducted via survey (appendix 3) completed by group participants to investigate the participants' subjective perception regarding the LGM system (Table 2).

| Table 2 | ATTITUDE REGARDING THE CURRENT CLINICAL INFORMATION RECORDING AND SHARING SYSTEM(S) | | | | |
|---|---|---|---|---|---|
| **Confident With Using the Electronic System(s)** | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
| | 8.3% | 8.3% | 25% | 50% | 8.3% |
| **Satisfied With the Electronic System(s)** | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
| | 25% | 41.7% | 25% | 8.3% | 0% |
| **Overall Satisfied With the Current Combined Systems(s)** | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
| | 0% | 91.7% | 8.3% | 0% | 0% |

The results show that majority OTs (83.3%) in this study are neutral or agreeing that they are confident of using current electronic systems for clinical information sharing purposes. However, though they have no significant issue with using the electronic systems, more than half of the OTs (66.7%) is not satisfied with their experience when use the electronic systems. More importantly, nearly all the participated OTs (91.7%) are not satisfied with the current LGM system they use at their routine practice, which indicated that there is still a huge room to improve for the LGM system to become an ideal platform for sharing clinical information.

The major theme of 'areas to improve (the friction) for the LGM system' were further analysed in the following subthemes:

- to overcome the limitation of traditional methods
- to streamline the person driven process
- to introduce a universal and standardized pathway
- to improve the infrastructural and ICT support for the electronic systems

- to overcome the limitation of current EMR systems

### To Overcome the Limitation of Traditional Methods

The traditional methods are based on paper based notes, which often only has one physical copy and this could cause delay due to accessibility. Clinicians expressed strong desire to have a more ideal method to improve the accessibility of the clinical information record.

> *"I sometimes go to the ward and I can't find the paper notes. Actually I spent 10 minutes looking for the notes, to just try to read them before I see the patient. Then when I can't find them I go to see the patient, kind of...going in blind I suppose. Then when I come out I can't find the notes to put my word in."* OT in acute setting

Furthermore, in a sub-acute or community setting which has prolonged input with a client, it is hard to hand over clinical information due to the large amount of data requires to be summarised and shared, hence a more efficient way to navigate through and share clinical information in sub-acute and community setting is highly desired.

> *"This is progress note driven, and there might be an initial (assessment) form but there is probably a lot more information from my note."* OT in sub-acute setting

In addition, paper based data form has limitation in terms of describing home environment, which may cause important risk factors being overlooked by treating OT.

> *"…sometimes from looking at that photo, instead of saying yes, ticked the box that someone has two steps, seeing what it looks like is much more useful for us…."* OT in community setting

Though fax is widely available and used often for information sharing, it is not entirely reliable that information may go missing without notice. This might cause significant delay of information delivery which affects the efficiency of clinical information management.

> *"I think it does happen (missing faxes). Because we got a multifunction and it has prints and faxes and everything goes to the one machine and sometimes document get in between. People come and grab their stuff and don't look at it. Then you might not get until 3 days later the documents were sent to you."* OT in inpatient rehab setting

Phone calls are more direct and reliable in ensuring information being delivered between settings but also could be highly time consuming. OTs with a high demand caseload require a more efficient method in routine clinical information management.

> *"How many OTs are at their desk to answer phones or available to take the email during a day, very few. We are always out on home visits or on the wards."* OT in acute hospital

In summary, traditional information sharing methods of the LGM system only allow single access to the individual information source (individual gear) which could cause delay when original or particular gear is missing or unavailable. The information flow is sequential as demonstrated in Figure 1. Therefore it is more ideal to improve the current single

access system to allow simultaneous engagement with multiple subsequent gears (the information receivers) to meet the requirement for efficiency and reliability of the contemporary OT clinical information management.

### To Streamline the Person Driven Process

Many participants have mixed views regarding the share of clinical information between sites. The most common response is that it is primarily person driven, and the success rate and efficiency relies heavily on the individual motivation and experience of the relevant cases from both the sender and receiver.

> *"It is very variable. Sometimes you can have a very positive, good experience you get very detailed, relevant information, and other times you get nothing… when that happens often that you start to get frustrated."* OT in rehab setting

Moreover, though OTs could build up a long term relationship with other OTs from other sites, Figure 1 illustrates the huge reliance of the involvement of all the individual gears to maintain the continued flow of clinical information. Therefore, the LGM system could break down if the key person (subsequent gear) is missing or not available. This is also the core area requesting improvement with the LGM system that it is asking for better reliability and consistency to guarantee the efficiency and quality of clinical information sharing across sites and caseloads.

> *"I have similar experience that some of the handover information might not get to you. You did the same thing, you just didn't get what you wanted to get because some staff might be on leave."* OT in acute setting

### To Introduce a Universal and Standardized Pathway

Participants have used the words "antiquated", "patchy" and "disjointed" to describe the current clinical information system in LGM. There is currently no standardized and universal pathway for OTs across sites or interstates to share clinical information. OTs are using various individual methods and formats, which could cause significant duplication, delay and information missing due to the inconsistency of the system setup.

> *"The point I am following up with Sue is that if you are using your personal email to scan things through, for example, while I was away for a week sick, no one has access to that information … So the email system is a personal thing, you don't actually get adequate information necessarily.*" OT in community setting

In LGM system, this would mean the co-existence of multiple parallel gear systems (different sizes of the teeth of gears) in the process of information sharing. These different sizes of gears would likely cause increased friction and reduced efficiency due to the less ideal cooperation and information conveyance. Therefore, it could be enhanced by streamlining the information management process for a better integration of the large numbers of variables that exist in the current parallel systems.

### To Improve the Infrastructural and ICT Support for the Electronic Systems

The OTs from these regional LHDs have expressed their significant concerns regarding the infrastructural and technical support they received for the ICT.

> *"We just don't have the IT support, it is just terrible."* OT in acute setting

This is believed to have caused a significant limitation of the usefulness of current electronic systems and subsequently triggering substantial delay of information delivery. Therefore, more resource and enhancement in ICT support is essential to significantly improve the performance of the LGM systems.

> *"Keeping in mind that our IT is atrocious…So you can be in the middle of sending an Email and just suddenly got not responding and you got all the information you have put into an email is gone."* OT in community setting

### To Overcome the Limitation of Current EMR Systems

Clinicians are aware that the lack of specific forms and module designed for OTs in current EMRs limits the ability of LGM electronic systems to be used to their maximum capability. Opportunities exist to strengthen the existing EMR systems by integrating specific allied health design features.

> *"I think it just was not considered when they built the EMR, because there are awful loads of forms and process in there and some of them are so unused... I asked where the allied health forms.....and they said we haven't built anything for allied health, didn't actually think about it."* OT department manager

Some OTs have found that the current EMR systems are not very user friendly and it could be very confusing and time consuming for them to use the systems to achieve what they desire for clinical information management. Therefore improving the user friendliness is another important area to address when upgrades the current systems.

> *"Very difficult in current systems, because it seems to be caught on different sorts of things, I think by looking at the clinical notes, or my looking at something else, I finish up doing a few things to find what I want."* OT in acute hospital

There is no consistency of the design of the interface of current EMR systems. Clinical OTs could find it quite challenged to master the use of individual EMRs. There is also apparently insufficient formal training provided for particular EMR that it is causing staff to spend extra time in using the systems with low efficiency. This could be significantly improved when a universal system is developed and also the increased provision of ICT support is in place.

> *"I think it is a little bit frustrated because they tend to be so many different systems....it makes it difficult if you work across a number of different areas."* OT in sub-acute setting

Another potential area to improve is a further development of a suitable contingency plan to reduce the impact causing by the system outage as currently it is common that the paper based record is the only backup system and a dual system could be time consuming in daily practice.

> *"When it was gone down, we have no other way of finding out the information other than going up to the wards. We have to physically go to the notes."* OT in acute setting

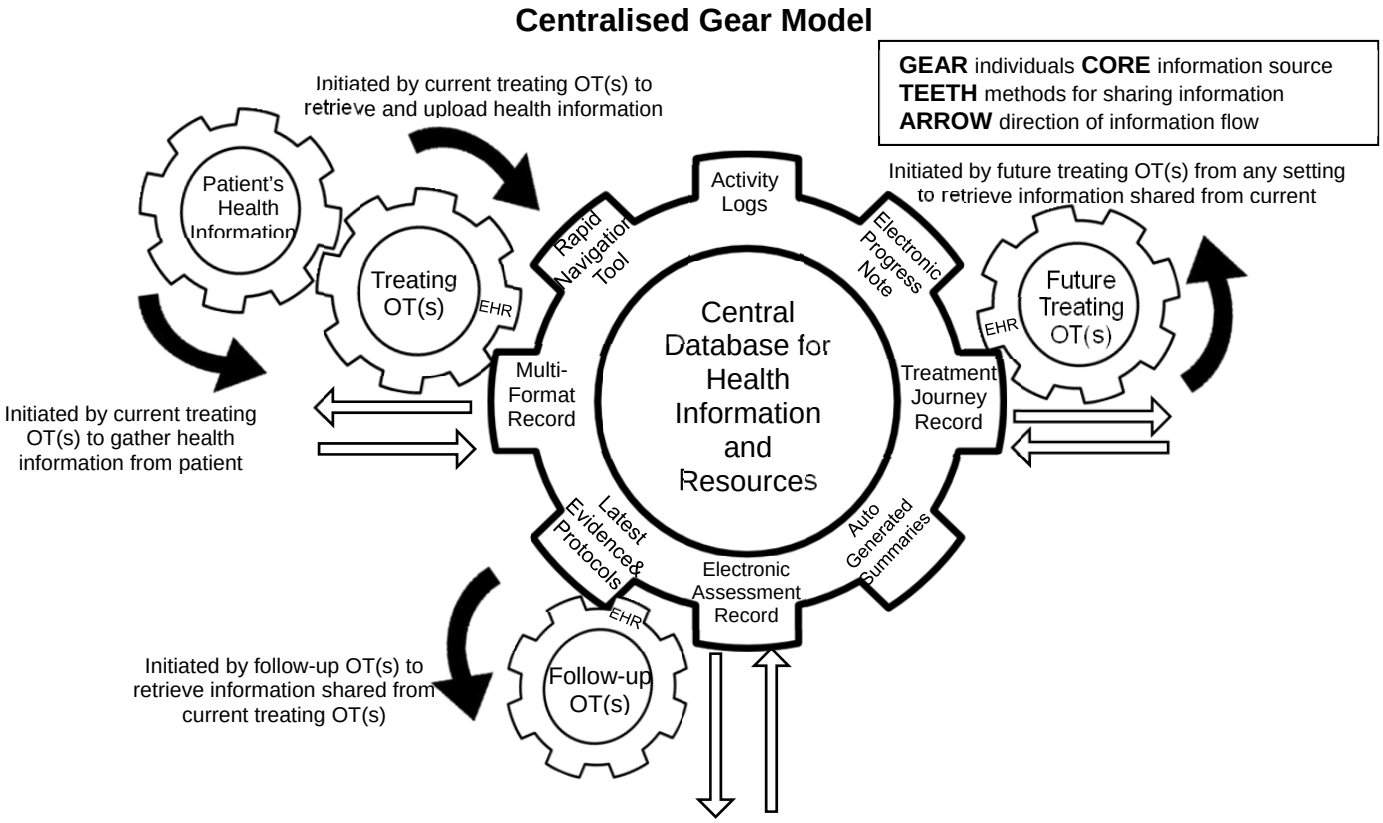
To sum up, the current LGM systems have great potential to accommodate the needs of contemporary OT clinical information management. Comprehensive and insightful strategies are required to be developed and implemented to address the limitations of traditional and EMR systems. More resource is required to dedicate to ICT support and streamline the person driven process to offer a universal information sharing pathway.

## Research Question2: What is an ideal state of a clinical information record system for contemporary OT practice?

### The Centralised Gear Model

The summary of the LGM systems serves as a starting point and provides some deductive ideas of how to further develop and upgrade current IGM systems. The research question two is then introduced to assist the implementation of the 'Dream' and 'Design' process of the AI (Trajkovski et.al, 2013). Based on the responses of the participants, the hypothesised ideal health information management system is summarized as the Centralised Gear Model (CGM), demonstrated in Figure 2 below.

**FIGURE 2:** *Outline of the Centralised Gear Model*




### Desirable Features

When discussing the main theme of 'desired features' of the CGM system, participants' ideas were summarized into the following subthemes:

- integrated and centralised database with full log of past and present clinical activities
- a universal system interface with a user friendly navigation module
- ability to upload electronic information in multiple formats
- auto-generated discharge summaries and clinical activity reports
- links to evidence based practice resources

### Integrated and Centralised Database with full log of past and present clinical activities

In comparison to the parallel systems and databases used by OTs in LGM, a core concept raised from the group is the use of a centralised database for storing and processing all the health information gathered from OTs across practice settings. As Figure 2 displays, the CGM system could allow a two-way information flow instead of the one way in the current LGM system.

> *"Well, I wish we are able to upload forms and scans to the database to share information for when a patient is an inpatient or community."* OT in community setting

Moreover, the CGM system will enable practitioners from one setting to have direct and instant access to existed clinical information collected from other settings with no delay. When not requiring depending on the initial gear to distribute information, it would fundamentally eliminate the major friction factor generated by the person driven process in the LGM system. It is also suggested to be important for the CGM database to integrate the information gathered from other multidisciplinary team members for clinical OTs to access to more comprehensive health information.

> *"A MDT (multidisciplinary team) system that I can read everybody's note in it…"*OT department manager

A full log of past and present record of clinical OT input across practice settings is considered vital to provide a greater overview of patient's treatment journey for a better continuity of care. Brewin (2002) also supported the importance for OTs to review patient's total treatment episode as a requirement for the implementation of EBP. This is believed to assist the overseeing of patients' functional changes over time, especially for chronic deteriorating diseases such as dementia and multiple sclerosis. When combined with the features of the centralised database with electronic data of clinical practice and an efficient navigation module, clinicians would likely have more success in screening and detecting any unusual changes or disruption of care based on the information of patient's baseline function and current clinical inputs.

> *"…pass information from one OT area to another, your home visit and all the stuff is there, so we can then look it up and go on with..."* OT in acute hospital

### A Universal System Interface with a User Friendly Navigation Module

To reduce the friction causes by the non-standardized system interface in LGM, participants stated their preference for a universal system interface for the CGM system. Some OTs also emphasized the importance of having an intuitive and user friendly navigation module to locate desired information in the vast centralised database

> *"Something quick to get into so that you can find the information you want, without too much hassle."* OT in community setting

### Ability to Upload Electronic Information in Multiple Formats

Due to the requirement for client-centred practice in contemporary OT practice, the CGM is required to not only share medical information but also include individual's environmental and functional information. To implement this requirement OTs will need the CGM system to have the ability to upload information in multiple formats especially records of photos for the home visit completed by OTs. Digital cameras are widely available and being used by OTs in capturing home environment information. Therefore it is essential for OTs to be able to share this unique and invaluable health information in the CGM system.

> *"Also being able to not just attach PDF, also somewhere for photos is a big thing for us, especially from home visit."* OT in community setting

Another important component for the CGM is to allow OTs to have direct access to all the record of clinical OT assessment and intervention. Participants envision this could be completed by a parallel system solution, i.e. direct electronic data entry with electronic devices, or scanned copy of written documentation. Most importantly, both methods should only require OTs to complete the data entry process once and also no additional data processing procedure should be included for the future use of the data.

> *"…what would be ideal is there was a place where you upload relevant clinical information, that is a one-off, rather than writing in the notes then we scanned that and sent it through."* OT department manager

### Auto-generated Discharge Summaries and Clinical Activities Reports

Brewin (2002) stated that a highly desired feature for a successful electronic health record system is the ability to facilitate or simplify OT's routine clinical case hand-over to generate progress and discharge reports. Participants anticipated a practical feature for the CGM system is its intuitive capacity to retrieve key information from OTs' assessment and intervention records then automatically generate discharge reports when requested.

> *"…So having our home visit report and our initial assessment being able to electronically generated, especially in community it is a big time saver."* OT in community setting

In the CGM system, all clinical activities require sign off using the clinician's own electronic signature which links to their user accounts. Many systems built with LGM design such as EMR & ACCR has already encompassed this feature. This would enable the systems to automatically capture the frequency and duration of all the clinical activities. Subsequently, the data could be used to generate clinical activity reports for analysing and identifying the trends of OT clinical service. Brewin (2002) stated that this feature could be used for monitoring interventions outcomes and service effectiveness for service evaluation and planning purposes.

> *"So that means they are automatically signed, electronically for you and then the time you log in/log off.....so they use to run reports that nursing unit manager down in ED, used to run reports on occasions of services and demands for OT or physio."* OT department manager

### Links to Evidence Based Practice Resources

An integrated function for shortcuts to the most up-to-date EBP evidence and clinical protocols for OT professionals are also highly desirable to the focus group participants. This feature is considered an essential step to improve the implementation of EBP practice for OT professional across all practice settings.

> *"…you can click 'up-to-date' and put 'cerebellar infarct' and 'therapies' and actually see what evidence there is…"* OT department manager

### Potential Benefits

When discussing the potential benefits of the CGM system, participants' ideas were summarized into the following themes:

- Benefits for clinicians
- Benefits for patients
- Benefits for local health districts

### Benefits for Clinicians

#### Minimize Duplication

The features of the centralised database and the full logs of patient contact information of the CGM system will facilitate clinical OTs to timely access to health information gathered from OTs in other practice settings. Therefore, clinicians could confidently avoid unnecessary repetitive data collection process when they conduct their clinical assessments. Nearly all participants in this study considered this as the most desirable improvement they would be keen to receive from the CGM system as it will undoubtedly minimize the clinical time and resources lost in current LGM system. In particularly in rural areas, avoiding duplication in routine OT practice would likely allow OTs to devote more time to clinical service delivery and enormously increase their ability to meet the growing demand of caseload with the limited OT resources.

> *"Timely access to information that you need, and less duplication, far less duplication."* OT in acute hospital

#### Reduce Demand on Administrative Tasks

The centralised database is also believed to be able to significantly save clinician's time spent on administrative tasks including locating the physical charts, completing health information handovers and recording clinical activity statistics. In this way it substantially free up clinical time for clinicians to focus more on direct patient care.

> *"…potentially I guess you can look at if there is any statistic you want to draw out of that… I guess the opportunity is always there to have report that you can draw out from the electronic system."* OT department manager

In addition, because of the features of universal interface and quick navigation module in the CGM system, OTs could save a lot of clinical time in trying to wait for logging in multiple systems, learning how to master different system interfaces, and most importantly, ability to locate desired resources more efficiently.

> *"…You would save a lot of time if your information can be accessed by others; you don't have to do all the handover."* OT in community

Compared to the constant sender initiated, delayed and person driven information sharing process of the LGM system, the instant, receiver initiated (once information uploaded by sender) information sharing mechanism of the CGM system is considered more efficient and reliable in sharing desired health information.

> *"…I would like that information to be accessible to someone who is motivated and interested to access to those information, rather for me to find time in my day to go backwards ...."* OT department manager

### Improved Clinical Decision Making

When avoidable duplication and time spent on administrative tasks is optimized, clinicians will unquestionably have more time to concentrate on clinical care, hence less likely to have to make clinical decisions based on limited evidence and inadequate patient health information. In addition, with more available patient environmental and functional information, OTs could prioritize their clinical caseload more accurately and confidently. This is also contributing to the reduced work related risk for clinical OTs as they will be better informed and prepared for the foreseeing manual handling and environmental hazards of the individual circumstances.

> *"The referral information, home visit report that the one we work on together to get all your pictures, and the mods that in the picture was great before I went out, so I knew where I was going out to."* OT in sub-acute setting

> *"....if I had that information available to me not just a little referral, I could prioritize a little bit better with the time…"*OT in community setting

### Improved Implementation of EBP

EBP is an essential component in the contemporary OT clinical practice. With the improved accessibility of comprehensive patient health information and latest EBP evidence provided by the CGM system, OTs could better evaluate the effectiveness and appropriateness of their assessment and intervention.

> *"…see what evidence there is…so ok in that particular condition there might be a protocol, has been endorsed state wide then you can just go 'cool, I am using the gold standard right now with this patient.'"* OT department manager

## Benefits for Patients

### Better Quality of Clinical Care

Assisted by the CGM system, OTs could be more efficient in prioritizing their caseload and making sound clinical decisions based on the best evidence and comprehensive patient health information, hence patient could benefit from receiving a more timely and higher quality of clinical OT service.

> *"I think just the quality of the service that you provide, it is enhanced by having as much as information as possible"* OT in acute hospital

Another prospective benefit for patients in rural area with limited OT resources is the potential earlier access to clinical

OT service. In CGM, OTs could have enhanced capacity for their caseload thanks to the reduction of duplication information gathering process and administrative tasks.

> *"…maybe 10% more people see in the actual day, and we know that we have to prioritize quite heavily in the ward in a hospital like The Tweed Hospital…basically you can see in a team of 4, an extra 6 to 7 people seeing every week."* OT department manager

### Improved Continuity of Care

Unlike the possible delay or missing of information occurred in LGM system, patients would likely receive smoother continuity of care in CGM as health information could be more timely and reliably deliver to the next service setting hence appropriate clinical management strategies would be applied by OTs in the subsequent practice setting to ensure the consistency and continuity of OT input.

> *"And hopefully much, much smoother journey for patients outcomes"* OT in acute hospital

### Eliminate Need to Partake in Repetitive Information Gathering Processes

With the centralised database in CGM, patients would not need to provide repetitive information when their previous health information is timely accessible to the treating therapist.

> *"...just it is easily communicated because we do double up information quite a lot. And people, especially in the hospitals they get sick of being asked the same thing over and over…"*OT in acute hospital

## Benefits for Local Health Districts

### Cost Saving

Although it might be a significant cost to design, implement and maintain a CGM system and possibly a temporary decline of efficiency at the beginning. Once the system is well established and all staffs are well trained in utilizing the system to improve their efficiency, it could potentially bring a significant profit to the health service. From a financial point of view, the efficient use of clinical time by therapists is considered as an indirect cost saving strategy to manage the increasing work demand for the local health districts. In 2003, there were 412 OTs working in NSW regional areas (Services for Australian Rural and Remote Allied Health, 2003). Hypothetically, if the average wage of each therapist was $35 per hour, and each therapist could improve their efficiency by approximately 10% or "saved" 3 hours clinical hours per week through the minimization of redundant repetitive work, then the net lump sum saving in monetary value to NSW Health workforce would have been equivalent to $2,249,520 per annum.

### Reduced Risk of Clinical Incidents

When OTs are able to make clinical decisions based on comprehensive and latest health information, it will significantly reduce the risk for preventable clinical incidents. Particularly regarding the OT home visits, a good understanding of the patient's functional capacity and the home environment setup is likely to increase the confidence for the clinician to prepare for necessary manual handing and choose appropriate equipment.

*"The referral information, home visit report that the one we work on together to get all your pictures, and the mods that in the picture was great before I went out, so I knew where I was going out to."* OT in community setting

### More Accurate and Thorough Service Performance Information

Brewin (2002) suggested that the electronic health record system should be able to assist OTs to monitor the effectiveness of the clinical service and provide information and evidence for service evaluation and planning purposes. Within the CGM system, clinical activity will be more timely and accurately captured when compared to the non-standardized methods used in the LGM system. Participants believed that the enrichment of the clinical activity statistic dataset will facilitate the health service to make future strategic decisions relating to service restructure and funding allocation.

*"It is good, theoretically if being able to draw out that information, for either getting more OT position or more funding, or....how many equipment prescription in a set period and how many Enable application in that period. That information could be quite useful…they could look at that in a cost-effective point of view and staffing point of view."* OT department manager

## Possible Future Barriers:

When discussing the potential barriers to the development and application of the hypothesised CGM system, participants' ideas were summarized into the following themes:

- availability of funding and resources
- practical technological execution of the desirable features
- setup of a reliable back-up system
- acceptance from patients and OTs to utilising ICT
- protection of patient confidentiality within a shared database

### Availability of Funding and Resources

The participants' responses have confirmed the Arabit (2010)'s opinion that the major concern for the CGM system is the feasibility of having such a system built and maintained, when there were already multiple systems are running with the LGM design. The participants are also not confident that OT's needs will be taking significant priority when compared with other disciplines. Chedid et al, (2013) expressed her concern that the workplace barrier including the availability of resources, ICT support and staff training will act as a major barrier for OTs in rural NSW areas to use ICT. Their study also brought up the concern that though there are considerable advantages and potential of utilising ICT in rural OT practice, it could fall short due to the insufficient resources.

*"Because it is resource...how would people would pay for the system...with all these systems around....we can put out a system for doctors, nurses, but why for OTs?"* OT in acute setting

### Practical Technological Execution of the Desirable Features

Figure 2 illustrates theoretically what desired features should be integrated in the CGM system. However, Arabit (2010) worried for the feasibility of implementing ICT changes in the practical world. There is still a huge need for further future studies and trials for the CGM in clinical practice due to the complex nature of OT's practice scope.

*"I think the other issue would be the complexity of the type of information we like to exchange. We look at physical, cognition, sensory, home environment, everything. That level of complexity of OT point of view, for it to be useful to us and for us to be satisfied to use, it actually has to be quite complex because our jobs are quite complex. And the build of it would have to be quite complex."* OT department manager

### Setup of a Reliable Back-up System

The common weakness of any electronic database is the vulnerability of the loss of connectivity due to network or power outage. The participants concerned that when unplanned outage occurs, it will be challenging for OTs to access to the centralised database or potentially lose the important clinical data. How to implement a reliable contingency system to prevent data loss and allow emergency access to the health information record is crucial to the usefulness and stability of the CGM system.

*"What happen if they crash? What is our contingency? … What are we going to do when we can't access to those information for whatever reason.... What is our back-up option? For me, from an OT point of view, it is probably terribly traumatic because we could probably wait for hours ultimately...."* OT in acute setting

### Acceptance from Patients and OTs to Utilising ICT

The CGM system is relying on ICT to implement the data entry and retrieval processes, which might inevitably include the introduction of the use of various electronic devices. Participants expressed concerns regarding how elderly patients and some OTs who are not familiar or confidential with electronic gadgets would feel when required to use them to complete their assessment. Schaper and Pervan (2007) identified the acceptance of technology by OTs could be a major barrier to its use and this finding is further supported by both Arabit (2010)'s and Chedid et al. (2013)'s studies as a significant potential community barrier.

*"But people are more likely need to work with those who are not necessarily familiar with technology. Of course we are using technology, I think we have to be mindful...I think pen and papers will be with us for a long time, because we need people to draw. It is interesting to just watch them holding the pencil...."* OT in acute setting

### Protection of Patient Confidentiality within a Shared Database

Another significant concern raised by the participants is the potential breach of the patient confidentiality when a centralised database in CGM is accessible by all the health disciplines. Participants' opinion confirmed Arabit (2010)'s concern for the potential privacy breach when introduced a centralised shared database. With the introduction of the HealteNet (NSW Health, 2012c) in NSW, it is inevitable for GPs and other private health practicians to be authorized to access the shared database as illustrated in the background section. How to both control and oversee the authority for clinicians to access to patient's health information while offering responsible clinicians a convenient channel to timely access to desired information, needs to be carefully balanced and handled to protect the patients' confidentiality.

*"I actually personally don't think the GPs should have access to it as such. I think it is within the NNLHD, our service we are responsible for, we are not responsible for what the GPs do, like it is a confidential thing."* OT department manager

# DISCUSSION

### The Concept of Health Information and Electronic Health Record

People often use the term 'medical information' or 'clinical information' to refer to the data collected and shared in clinical service. Therefore people specifically use 'electronic medical record' to name the system built purposefully for sharing patient care information. However, as 'medical information' is used to describe the record of the practice of medicine, and 'clinical information' is best to describe the information in relates to direct patient care, the accuracy of using these terms to encapsulate the full expand of patient's environmental, social and function information is arguably adequate.

Due to this reason, the term 'health information' is preferable to cover all the information matters to an individual's health and care. Therefore in this study, we have kept the term 'clinical information' when referred to the information processed in the LGM system, but replaced it by ''health information' to describe the information collected and shared in the ideal CGM system in the future.

Subsequently, it also provides a differentiation between electronic medical record (EMR) and electronic health record (EHR), which was often considered an interchangeable term in the past. In 2013, the updated concept of EHR was introduced by the United State Office of the National Coordinator for Health IT (2013) as per following description: "EHR does contain the medical and treatment histories of patients, an EHR system is built to go beyond standard clinical data collected in a provider's office and can be inclusive of a broader view of a patient's care. EHR system can:

- Contain a patient's medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiology images, and laboratory and test results
- Allow access to evidence-based tools that providers can use to make decisions about a patient's care
- Automate and streamline provider workflow"

In Australia, a similar trend of using 'health information' to replace 'medical/clinical information' is noticed by the introduction of HealtheNet (NSW Health, 2012c). The HealtheNet aims to serve as the comprehensive portal to integrate all the clinical services both in hospital and community, and hopefully as a milestone to the establishment of national electronic health record in the future.

### The Upgrade from LGM to CGM for the Electronic Health Records

Although theoretically there is huge potential for current LGM systems to become more efficient and effective, through improved cross integration and advanced customisation, by comparing with the results of other background studies, this study has confirmed the significant potential barriers for the design and implementation of the CGM system in the practical terms. Amongst the barriers, the technical and funding barriers are the two most outstanding issues as substantial investment is already devoted for developing and maintaining current LGM systems. Even with the trend of having integrated and centralized system and moving towards a national electronic health record, how to smoothly transfer the current data into the centralised database without jeopardizing the stability of clinical services is still a significant challenge.

In addition, it is still unclear what the resource cost would be to have an Electronic Health Record (EHR) system designed based on the CGM when weighing against the potential financial benefit which would gain from the upgrade.

Therefore, further studies to test and validate the hypothesised CGM model for OT practice in reality will be required.

Nevertheless, as CGM system could bring significant potential financial benefits to the LHDs and have advantages to address OTs' unique needs, it is important for the policy makers and program developers to take into account the CGM when implementing system upgrades or when redesigning current EMR systems.

### Limitation of this study

Due to the limited scope of this research, it is only a preliminary step to understand how could health information be better shared and used by clinical OTs with the upgrade of current electronic medical systems to an integrated electronic health record system. More investigation of other rural LHDs and across the border boundary is required to fully understand how to improve the current EMRs to better address the needs of clinical OT practice in rural areas.

Furthermore, there is a significant socioeconomic and infrastructural difference between the rural and metropolitan areas. How the findings of this study would apply to the EMRs for the metropolitan OT practice is yet to be tested in future studies in metropolitan areas.

## CONCLUSION

When compared with the traditional paper-based system, the additional integration of EMRs and other ICT systems into OT clinical practice under the LGM are perceived to have significant advantages. An upgrade of current EMRs from LGM to CGM to form a universal EHR system is highly desirable for OTs to share health information with all the health discipline. This upgrade has the potential to bring numerous benefits for the OT clinicians, the patients and the LHDs.

The recommendations arising from this study are:

- Upgrade or redesign of current Electronic Medical Record Systems to form a universal electronic Health Record System based on the centralized gear model.
- Allocate more resources to support the development and implementation of an Electronic Health Record System.
- Consult with OTs and appoint representative OTs with clear understanding and insight of the contemporary OT needs to the relevant working committee prior to any major changes on current Electronic Medical Records and organize ongoing review of system efficiency and efficacy in meeting the needs of contemporary OT practice.

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**Appendix 1: Focus Group Guiding Questions**

Topic 1: What is your experience with sharing clinical information with OTs working in other facilities or clinical areas? (10-15mins, 3 mins each participant)

- The purpose is to let everyone understand the different needs required in various settings.
- What setting are you in?
- What (info do you provide/receive), when (in what circumstance/how often), who do you share with, how(method)?
- What is your overall feeling about that? (how effective/efficient, benefits/ challenges, how would you best like to go about it)

Topic 2: What is your experience working with an electronic clinical information record system in your routine practice? (10-15 mins, 3 mins each participant)

- What system(s) do you use (EMR, ACE, any others?). What function(s) of the system is important to you in terms of clinical information management
- What is your overall feeling about that? (how effective/efficient, benefits/ challenges, how would you best like to go about it)

Topic 3: Scenario discussion:
The state health department is consulting OTs to develop an electronic clinical information record system which has specific components for OTs to facilitate information gathering and sharing. From your point of view: (40-60 mins)

- What features would you like to have? (can be specific to individual needs but encourage more generic functions that can be utilised across a range of OT settings)
- Why are these features important to you? What are the benefits for you, for other clinicians, for the OT department?
- What do you foresee may be barriers/challenges to rolling out the new interface/functions, why (cause of barriers), how (to overcome challenges).

Audio record to be captured under participants' consent for data collection purpose
Duration: 60-90 mins

**Appendix 2: Focus Group Guiding Questions**

| CHRACTERISTICS OF PARTICIPANTS | | | | |
|---|---|---|---|---|
| | Current study | | WA OT labour force survey 2007 | |
| **Gender** | Male | 17% | Male | 6% |
| | Female | 83% | Female | 94% |
| **Age Group** | 20-30 | 18% | 20-30 | 30% |
| | 31-40 | 27% | 31-40 | 29% |
| | 41-50 | 27% | 41-50 | 23% |
| | 51-60 | 27% | 51-60 | 12% |
| | 61-65 | 0% | 61-65 | 4% |
| **Education Level** | Diploma | 0% | Diploma | 9.4% |
| | Undergraduate | 91% | Undergraduate | 80% |
| | Master degree | 9% | Master degree | 5.6% |
| | Doctoral or higher | 0% | Doctoral or higher | 0.4% |
| **Average Practice Experience** | | 19 years | | 9.3 years |
| **Primary Practice Setting** | Acute | 27% | Acute | 21% |
| | Subacute | 27% | Subacute | 17% |
| | Community | 18% | Community | 17% |
| | Multiple settings | 27% | Multiple settings | N.A |
| | Other settings | 0% | Other settings | 45% |
| **Average EMR Experience** | | 3.8 years | | N.A |

**Appendix 3: Focus Group Demographic Questionnaire and Survey**

Part1*: Please tick* the box that *best describes* your status:

1. What is your gender?

   ☐ Female ☐ Male

2. What is your age?

   ☐ 20-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61 or over

3. What is the highest level of education you have completed in OT area?

   ☐ Diploma ☐ Undergraduate ☐ Master degree ☐ Doctoral degree or higher

4. Which primary OT practice setting are you in?

   ☐ Acute ☐ Community ☐ Mental Health ☐ Sub-acute

5. You are confident with using the electronic clinical information record system of your office:

   ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

6. You are satisfied with the current electronic clinical information record system of your practice:

   ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree

Part 2: *Please fill in the blank* for each of the following question:

1. How long have you practiced as a clinical OT?_____ years

2. How long have you started using an electronic clinical information record system?_____ years

(supplemental question) Overall, you are satisfied with the current clinical information recording and sharing systems (including both paper based and electronic methods) in you practice setting.

☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree