



**NORTH COAST**  
**AREA HEALTH SERVICE**  
**NSW HEALTH**

## **INTEGRATED ACUTE AND COMMUNITY SERVICES INCREASES CAPACITY IN A RURAL BASE HOSPITAL**



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## **ABBREVIATIONS**

ALOS: Average Length of Stay

ACHS: Australian Council Healthcare Standards

CAPAC: Community Acute Post Acute Care

CMO: Career Medical Officer

CI: Confidence Interval

COPD: Chronic obstructive pulmonary disease

CSD: Central Sterilising Department

DNW: Did Not Wait

DRG: Diagnostic Related Grouping

DVT: Venous Thrombosis

ED: Emergency Department

EDIS: Emergency Department Information System

ECCC: Express Community Care Centre

GP: General Practitioner

HIE: Health Information Exchange

HiTH: Hospital in the Home

MRN: Medical Record Number

NCAHS: North Coast Area Health Service

OR: Odds Ratio

PAS: Patient Administration System

PMBH: Port Macquarie Base Hospital

RCT: Randomised Control Trials

## **MAIN MESSAGES**

Combining existing acute and community services to create the Express Community Care Centre (ECCC) has produced efficiencies resulting in additional capacity at Port Macquarie Base Hospital. Providing operational management for the ECCC as part of the hospital emergency department but locating it separately from the main ED is a key component of its success.

Extending the operational hours of the ECCC later into the evening would assist in creating further capacity in the ED and reduce the clinical risk of patients who are not waiting for treatment when the service is closed. It would also provide capacity for additional day procedures thereby further increasing inpatient capacity.

Best practice models of care are developed predominantly in metropolitan hospitals. Adapting these models to suit the local considerations of rural hospitals with different levels of resources improves their success.

Clinical practice changes can be achieved by targeting identified patient groups and their associated services. Targeted programs need to be resourced to ensure the change occurs with appropriate consultation and clinical protocol development.

# EXECUTIVE SUMMARY

## **Background**

In July 2007 the Port Macquarie Base Hospital (PMBH) Executive established the Express Community Care Centre (ECCC) in response to the increasing demands on local public health services. NSW Health also required a reduction in the number of patients admitted in specified avoidable admission Diagnostic Related Groups (DRGs). The ECCC was designed to create capacity in the Emergency Department (ED) and to minimise or avoid the need for hospitalisation by providing care in an alternate setting. The ECCC comprises three care streams;

- **fast track** – patients who present to the ED with a triage score and presenting condition indicating they require a definable, relatively limited treatment that is unlikely to result in admission;
- **community acute post acute care (CAPAC)** – patients whose acute care needs can be treated safely and effectively in the home. Initial assessment and medical reviews are provided in the ECCC;
- **day procedures** - treatments suitable for delivery in an ambulatory setting such as blood transfusions are performed in the ECCC rather than an inpatient bed.

The ECCC is operationally managed by the ED however is located separate from the main ED. The redesign and integration of existing services allowed the ECCC to commence with the addition of clerical hours only. Existing clinical hours were reallocated from the main ED to the ECCC to staff the service from 0900 to 1700 hours, seven days per week.

## **Aim**

This study aims to determine what impact the establishment of the ECCC had on PMBH, focusing on the Emergency Department and avoidable admission DRGs.

## **Study design**

A comparative analysis of data pre and post commencement of the ECCC was conducted, including a combination of statistical and descriptive analysis. The study focuses on three main areas of activity: PMBH inpatient activity, Emergency Department and; avoidable admission DRGs as determined by NSW Health.

## **Findings**

### Inpatient activity

Overall inpatient activity at PMBH has increased when comparing data pre and post the establishment of the ECCC. Inpatient separations and bed occupancy increased despite a decrease in bed availability. The total number of surgical cases performed remained relatively constant, however the proportion of emergency cases increased by 4.8% to 45.1%. The number of elective surgery cancellations increased four fold, which may have resulted from efforts to accommodate the increasing emergency surgery.

### Emergency Department

ED presentations increased by 14.9% (25231 to 28993). The number of Triage 2 presentations increased by 28.5% (2049 to 2632). Although the proportion of triage 2 patients as part of the total number of ED presentations only increased by 1%, the increase in the volume of these high acuity patients presented significant workload and patient flow issues for the department.

There was no statistically significant difference for triage 4 and 5 patients in either the median journey length or the number of DNW patients pre and post ECCC. However, given the

growth in presentations to ED in the post ECCC period, the fact that these performance measures were maintained and did not worsen supports the argument that the ECCC provided additional ED capacity.

A substantially higher percentage of triage 4 and 5 patients DNW for treatment when the fast track service was closed thereby increasing the clinical risk. There is a statistical difference between pre and post ECCC of the proportions of patients who DNW when the service was open vs closed. This suggests that behaviours are changing with a possible explanation that once the ECCC became an established and guaranteed service, patients were less likely to wait for more minor presentations knowing they can return the next day and be streamed straight to the ECCC.

### Avoidable Admissions

With the exception of patients being treated for cellulitis, there were only marginal differences when comparing inpatient numbers pre and post ECCC for the eight avoidable admission DRGs. Inpatient admissions for cellulitis have reduced by 30% and corresponding admissions to the CAPAC service for cellulitis are the highest of all CAPAC DRGs. This group of patients was one of the original target groups when establishing clinical protocols for the ECCC and these results suggest a successful change in clinical practice.

Patients with a respiratory avoidable admission DRG occupy a significant number of inpatient bed days which increased during the study period. There were however, very few admissions to the CAPAC service for respiratory conditions.

The day procedure stream of the ECCC provided care for patients receiving blood transfusions. Inpatient numbers for this DRG remained constant both pre and post the ECCC suggesting additional capacity rather than practice change.

### **Limitations**

This comparison does not take into account year to year variability in hospital activity outside the two year study period.

The study does not identify whether the increased capacity resulting from the ECCC has provided services for previous unmet demand (ie. people who needed health services but who did not access them); serviced new demand due to the increasing population; or generated demand because the capacity now exists.

### **Key Conclusions**

The integration of acute and community services through the establishment of the ECCC, has created additional capacity for the ED and for patients requiring selected day procedures. In addition, results indicate a shift in clinical practice from inpatient to community care for patients treated for cellulitis, creating inpatient capacity. The success of the ECCC supports the argument that best practice models of care can be adapted to suit local context, in this case a rural setting.

## ***Recommendations***

1. Increase the opening hours of the ECCC as this is likely to
  - create further capacity in the ED,
  - reduce clinical risk as the results of this study indicate that DNW numbers reduce when the service is open, and;
  - reduce journey lengths further given the current operating hours have maintained the journey length despite increased activity.
  
2. Implement a targeted program to increase the number of respiratory patients admitted to CAPAC, in particular the respiratory avoidable admission DRGs. The reduction of patients admitted to a hospital bed for the treatment of cellulitis suggests this approach is successful in changing clinical practice.
  
3. Reduce the number of inpatients receiving transfusions in a ward bed by providing their care in the ECCC. Fifty six of the 69 patients who were admitted to an acute inpatient bed during the post ECCC period had a length of stay of 1.0 day, suggesting these patients may have been suitable for treatment in the ECCC.



## **INTRODUCTION**

Port Macquarie is a rapidly growing, regional city situated on the coast of NSW approximately four hours north of Sydney. In July 2007 the Port Macquarie Base Hospital (PMBH) Executive, in response to the increasing demands on local public health services, established a new service called the Express Community Care Centre (ECCC).

This report aims to evaluate how the establishment of the ECCC has impacted on the activity at PMBH. The results of this evaluation will inform future service planning. The evaluation compares data for periods pre and post implementation of the ECCC and covers three main areas of activity. The first relates to the overall activity in PMBH. The second is the Emergency Department (ED) activity and includes statistical analysis of a) patients who 'did not wait' for treatment and b) the average time patients spent in the ED known as 'journey length'. The third relates to the impact on Diagnostic Related Groups (DRG) identified by NSW Health as Avoidable Admissions. (Appendix 1)

## **BACKGROUND**

Population growth in the Port Macquarie area is increasing faster than the state average and the area also has a higher than state average population over 65 years of age (North Coast Area Health Profile 2009) (Appendix 2). The increased burden of disease associated with an older population results in a greater demand on local health services (Population Health Division 2008). Accessibility to the breadth of services that public health provides increased with a change in ownership of PMBH from private to public in February 2005. NSW Health recently developed an Avoidable Admissions strategy as a result of research undertaken by an Acute Care Taskforce in collaboration with the NSW Health Services Performance Improvement Branch (NSW Health 2007). The strategy identified eight medical conditions with specific low complexity DRGs considered amenable to non-admitted treatment (Appendix 1). PMBH, as part of the North Coast Area Health Services (NCAHS) overall target, was required to reduce by 30% admissions within these eight DRGs during 07/08. In addition, PMBH has no further physical capacity to increase services without capital investment.

In response to the increasing pressures on the local health service and as part of the Clinical Services Redesign initiative (ARCHI 2009) undertaken by the NCAHS, a new model of service delivery was developed and implemented at PMBH in August 2007. The service is a hybrid of currently accepted 'best practice' models (ARCHI 2009). The objective of the service was three fold:

- to create capacity in the PMBH Emergency Department (ED) to cope with the increasing demand,
- to reduce the number of admissions within the eight avoidable admissions DRGs, and;
- to increase inpatient capacity by maximising utilisation of the Community Acute/Post Acute Care Service (CAPAC) (PMBH 2007).

Best practice models for health care services are predominantly developed in metropolitan hospitals where resourcing and local context can differ to rural settings. The profile of the health workforce differs between rural and metropolitan NSW (ABS 2006). This limits the ability to implement best practice models in their entirety and requires adaptation to fit local resources and context.

The Express Community Care Centre (ECCC) is the name given to a combination of services provided at PMBH and includes the three services which provided data for this evaluation. The ECCC is operationally an extension of the Emergency Department (ED), however is located

some distance from the ED whilst still within the same building. The ECCC includes one treatment room with an ED trolley and three recliner chairs and comprises the following care streams:

- Emergency Fast Track – patients presenting to ED are triaged to determine their urgency rating. If the triage score and presenting condition indicates they require a definable, relatively limited treatment that is unlikely to result in admission, the patient is ‘streamed’ to the ECCC and seen as part of the fast track service. Typically these patients are assessed as triage 4 or triage 5. These two triage categories constitute 92% of all fast track patients seen in the ECCC.
- A fast track service was operational in the pre ECCC study period however it was run from a converted store room in the main ED and all presenting patients shared the same waiting room.
- Community Acute Post Acute Care Service (CAPACs) – this service is often described as Hospital in the Home (HiTH). Initial medical assessments and subsequent reviews occur within the ECCC. There are multiple referrals points including GPs and ED (hospital avoidance) or from inpatient units (hospital minimisation)
- The CAPAC service was operational in the pre ECCC study period however there was no medical governance resulting in an underutilised service
- Day procedures – treatments suitable for delivery in an ambulatory setting such as blood transfusions are performed in the ECCC rather than an inpatient bed. Prior to the ECCC, these procedures were performed in either the emergency department or more typically in an inpatient bed on one of the wards, usually the day surgery unit.

Appendices 3 and 4 detail patient flow through the ECCC.

The ECCC is operationally managed and staffed by the Emergency Department and is open seven days per week between the hours 0900 and 1700. The medical governance for all three streams is provided by Career Medical Officers (CMO) under the authority of the ED Director. ED nursing staff are rostered to the ECCC and provide care for the Fast track and day procedure patients. CAPAC patients who require any reviews or treatments in the ECCC are cared for by the nursing team of the CAPAC service. The ECCC commenced with no additional clinical staff, but rather re-allocation of existing nursing and medical ED staff. The only additional resources were clerical hours to attend the reception desk.

## **LITERATURE REVIEW**

A literature review was undertaken to identify evaluations of similar services (models of care) to those within the Express Community Care Centre (ECCC). The review focussed on evaluation methods and associated statistical analyses, and commonly accepted outcome and/or performance measures.

### ***Method***

A search of Medline, Cinahl and Cochrane Systematic Reviews databases plus Internet search of NSW Health website was undertaken for the period from 1996 until August 2008. Key search terms used alone and in combination included program evaluation, home care services, aftercare, ambulatory care, length of stay, outpatient clinics, hospital emergency service, trauma centres, emergency medical services, triage, admission, discharge and hospital in the home (HiTH). All searches were limited to English language and article references were reviewed for inclusion.

Papers included for review evaluated services comparable to the three services comprising the ECCC and included measures that are available (or potentially available) within the current data sources of the NCAHS and in particular PMBH. Papers excluded as outside the scope of this project were those that evaluated non-comparable services (eg. major metropolitan hospitals specialising in trauma), those that used measures not available from NCAHS current data sources or were solely cost analysis reviews.

### ***Discussion***

Only one article could be located that evaluated a combination or hybrid of services. There were more articles available evaluating single services such as Fast Track and Hospital in the Home. The following sections discuss these areas separately followed by a summary of evaluation methods used.

#### Combined service (hybrid)

Only one article could be located that evaluated a combination of services and whilst these services are not identical to the ECCC, the similarities are sufficient to warrant inclusion. Brierley & King (1998) evaluated a post acute treatment in the home service over 12 months which used two strategies to address pressures on acute beds in a non-metropolitan hospital. The first strategy was the upgrading of a short stay unit attached to the ED with a focus on rapid turn around for acute medical patients and referral to community services. The second strategy, and that most closely reflecting the ECCC was the hospital in the home program. Similar to the ECCC, 'the program enhanced existing services to create a new treatment stream for acute patients'. The similarities included the streaming of ED patients directly into the hospital in the home service with medical governance being provided by senior ED medical officers.

Evaluation measures used in Brierley & Kings' (1998) study were reported separately for the two strategies. Results reported for the short stay unit included total number of patients treated and daily average numbers showing an increase in utilisation as the service became established. Other measures were percentage of patients that required transfer to ward from short stay unit (0.5%), percentage of readmission to hospital within 28days (5.4%) compared to 5% for the whole hospital. This was benchmarked against the Australian Council Healthcare Standards (ACHS) threshold of 3%. The final measure for the short stay unit was the Average Length of Stay (ALOS) compared to the State ALOS for the top 20 Diagnostic Related Groups (DRGs) demonstrating a reduction for some DRGs however the authors note this is probably due to

lower acuity rather than absolute savings. Limited results were reported for the HiTH service and included the total number of patients and readmission rate within 28 days (11.8%). Reference was made to the most common diagnoses treated but with no numerical breakdown. The ALOS compared to the state ALOS (for inpatient) for two of the diagnoses (uncomplicated venous thrombosis and uncomplicated respiratory infections) demonstrated a reduction in bed days. This was then extrapolated across 12 months to give a theoretical bed day saving of 356, however without data tables it is not clear whether this 'saving' relates only to these two diagnoses or the whole service. Statistical testing of the data was not undertaken.

### Fast Track

Combs, Chapman & Bushby (2006, 2007) evaluated the implementation of an ED fast track service over a 12 month period. There was no comparative analysis with pre-implementation data and the data was not statistically tested. The measures used to evaluate the service included patients who 'did not wait' for treatment and the median ED journey time through ED. Patients defined as 'did not wait' (DNW) are those people presenting to the triage desk but following assessment do not wait for treatment. This results in increased clinical risk for these patients (Fry, Thompson & Chan 2005) and is therefore a valid performance indicator for an organisations risk management. Over the 12 month period there was a reduction in the mean DNW numbers from 57 to 43 and a 2% decrease in the mean DNW rate (7.2% to 5.2%). The use of DNW trends to benchmark the effectiveness of innovative work practices and service provision is supported by Fernandes et al (1994).

The median journey time through ED was measured 'as the median is less sensitive to extreme scores, in a sample, than the mean' (Combs, Chapman & Bushby 2006). The median journey time decreased by 28 mins (13%) for all patients through the ED. As an overall measure, this would indicate that the introduction of a fast track service assists with the journey of all patients though ED and not just the fast track patients to the detriment of higher acuity patients.

Toncich et al (2000) undertook to evaluate an ED fast track in an Australian tertiary teaching hospital over a seven month period, comparing pre and post implementation data. Reduction in the median length of stay of ED patients was chosen as the measure to evaluate operational goals. This was divided into length of stay for admitted and discharged patients. A sub category of discharged patients was created called fast track. The types of patients suitable for fast track were limited to presenting with a single problem that could be discharged within 60 mins after a medical consult.

Similar to Combs, Chapman & Bushby (2006), Toncich et al (2000) measured median time in ED. Statistical analysis was performed using a non-parametric Mann-Whitney U-test. Results of the analyses showed that whilst the median time for discharged patients reduced 4 mins ( $p = 0.28$ ) and also reduced 4 mins for total length of stay for all pts ( $p = 0.06$ ), the median time in ED for admitted patients increased by 85 mins ( $p < 0.0001$ ). Those patients who did not need admission were discharged quicker however those requiring admission remained in the ED longer. Toncich et al (2000) concludes there was no progress from the original times prior to the intervention and suggests that a major confounding problem was the lack of access to inpatient beds that winter which impacted on the staff workload and ability to process patients.

### CAPAC / HiTH

For the purposes of this report, the terms CAPAC and HiTH are used interchangeably.

A literature review was conducted by NSW Health (2004) forming part of the directions paper for Acute/Post Acute Care (CAPAC) for NSW. This review found wide variations between services making a 'comprehensive comparison of existing CAPAC services ... almost impossible'.

NSW Health suggests that generic indicators for evaluating CAPAC services may include:

- Unplanned readmission/representation rate to CAPAC or hospital
- LOS (both in hospital and within the program)
- Number of patients admitted and diagnosis
- Discharge destination
- Complications, adverse events

Additional indicators related to service cost were suggested in the paper, however cost analysis is outside the scope of this study.

Shepperd & Iliffe (2008) conducted a systematic review of 22 randomised control trials (RCT) comparing hospital at home care with acute hospital inpatient care. The selection criteria applied by Shepperd & Iliffe reflected the type of service that is offered at PMBH. This includes hospital in the home programs that admitted patients 18 years and over and 'if the hospital at home did not exist then the patient would be admitted to or remain in an acute hospital ward'. Obstetric, paediatric and mental health services were excluded as well as those providing long term care, outpatient care and self care programs. Studies were included only if standardised validated instruments were used to measure subjective outcomes, for example adverse events. Measures included readmission rates, general and disease specific health status, discharge destination and length of stay as well as patient focussed measures such as psychological well being, patient and carer satisfaction and functional status.

Due to the variations in the way hospital at home services are organised, services were categorised according to where patients were admitted from including early discharge of medical patients, those following elective surgery, admission avoidance schemes recruiting patients with a mix of medical conditions and care of terminally ill. Within each of the sub categories, various measures were analysed including mortality, readmission to hospital, hospital length of stay and total length of care. Other measures analysed included patient assessed outcomes, patient, carer and staff satisfaction and cost, however these are less relevant to this study.

Meta-analysis was undertaken on mortality, readmission rate and length of stay, however due to the small trials, the authors concede the meta-analysis was underpowered to detect differences in mortality and readmission. Odds Ratio (OR) with 95% Confidence Interval (CI) was applied when analysing both mortality and readmission rates. Studies used a combination of median difference and mean difference with 95% CI when analysing hospital length of stay and total length of care (hospital plus hospital at home). Shepperd and Iliffe (2008) conclude that a small reduction in hospital length of stay is achieved by allocation to a hospital in the home program however this increased the total length of care received. They also note that the total days of care a patient receives should be an indicator for any further evaluations.

### ***Summary of evaluation methods/measures***

The studies reviewed demonstrate commonly used and industry accepted measures to evaluate both Fast Track and CAPAC services.

Measures to evaluate ED, and in particular the effectiveness of Fast Track included

- Median journey time through ED (Combs et al 2007, Toncich et al 2000)
- Did Not Wait – percentages, mean (Combs et al 2007, Fry et al 2005, Fernandes et al 1994)

Statistical testing was undertaken by Toncich et al (2000) using a non-parametric Mann-Whitney U-test for median journey times in ED.

Measures to evaluate CAPAC/HiTH services included

- ALOS (Shepperd & Iliffe 2008, NSW Health 2004, Brierley & King 1998). Brierley & King also benchmarked against state ALOS (for inpatient)
- Total Length of Care – Inpatient plus HiTH (Shepperd & Iliffe 2008, NSW Health 2004)
- Readmission rate within 28 days (Shepperd & Iliffe 2008, NSW Health 2004, Brierley & King 1998). Again, Brierley & King compared to the whole organisation/ACHS benchmark
- Proportion (%) requiring transfer to ward from service (Brierley & King 1998)
- Discharge Destination (NSW Health 2004)
- Mortality (Shepperd & Iliffe 2008)
- Adverse events (NSW Health 2004)
- Patient profile including service numbers / diagnosis (Shepperd & Iliffe 2008, NSW Health 2004)

Statistical analysis using Odds Ratios was applied to mortality and readmission data, whilst mean and median difference was applied to LOS data

## **Conclusion**

Review of the literature highlighted several commonly accepted performance measures used in evaluating services similar to those within the ECCC. Evaluation of the Fast Track component of the service may include median journey time through ED, DNW and waiting times for all patients and by triage category. Analysis of these measures provides information on how the new service affects not only those receiving treatment through fast track, but also how this affects the journey of other patients through the ED. There does not appear to be any widely used statistical analysis applied to these measures however tests undertaken by Toncich et al (2000) for median journey times in ED may be applicable for this study.

Despite the variability within CAPAC services and the absence of standardised data, review of the literature demonstrates there are many industry accepted measures. The analysis of the CAPAC component of the ECCC could include ALOS and total days receiving care compared to inpatient data, readmission rates within 28 days, discharge destination including mortality, percentage of patients requiring transfer to hospital from program. Where possible and appropriate these should be benchmarked against peer or state data. An understanding of the patient profiles including DRGs is also important to gain an understanding of the types of patients treated in CAPAC. Adverse events could be included however it is expected that these will be very small numbers. Similar to the evaluations of fast track services, statistical testing is not widely applied to these measures for CAPAC services. Odds ratios may be useful for comparative analysis of mortality and readmission rates and length of stay data may be analysed using mean and median differences.

## **METHOD**

The aim of this study is to determine what impact the establishment of the ECCC had on PMBH, focusing on ED and avoidable admission DRGs.

### ***Ethics***

Ethics approval for this research was granted by the NCAHS Population Health and Health Services Human Research Ethics Committee.

### ***Study design***

The literature review (above) assisted with the design of the study and the choice of statistical tests applied. The study design is a comparative analysis of data pre and post commencement of the ECCC, including a combination of statistical and descriptive analysis.

The study focuses on three main areas of activity:

1. PMBH organisational activity (inpatient, ED, ECCC and surgical)
2. emergency department (DNW, journey length)
3. avoidable admission DRG as determined by NSW Health (appendix 1). These patients were either: admitted and treated as an inpatient; treated by the Community Acute/Post Acute Care Service (CAPAC); or received treatment as a day procedure in the ECCC.

### ***Study period***

The ECCC commenced in August 2007. The original data collected covered the 12 month period prior to the ECCC (August 06 to July 07) and 12 months following the implementation (August 07 to July 08). All data sets were de-identified.

It was noted that in April 2007, due to a refurbishment of the Central Sterilising Department (CSD), elective surgery was significantly reduced however bed availability remained stable. It is likely there would have been more available beds that month which could potentially affect patient flow from the emergency department. Therefore, both April 07 and April 08 were removed from all data sets, effectively giving 11 months comparison pre and post implementation of the ECCC.

## ***Data Sources and Analysis***

### **PMBH Organisational Activity**

Data was sourced from the NCAHS Acute Facilities Monthly Activity Performance Reports (Attachment A). This report is produced monthly by the NCAHS Clinical Information Department and provided the necessary aggregated data for PMBH. A descriptive analysis is provided comparing general organisational activity at PMBH pre and post the commencement of the ECCC. This assesses demand and activity on this health service and is intended to provide the background and context for further analysis of the key focus areas, ED and avoidable admission DRGs.

The data relating specifically to the ECCC fast track service was sourced directly from the Emergency Department Information System (EDIS). It was not possible to get this directly from the NSW Health Information Exchange (HIE) as the field in EDIS which identifies the patient as being seen in the ECCC is not uploaded to the HIE.

### **Emergency Department**

This dataset was sourced from the HIE. Data relating to patients treated through the fast track service in the ECCC is captured through the HIE as they remain part of the ED activity. The original data set was checked for abnormal data. A total of 19 records were removed due to

incomplete data. The final dataset contained 54224 records. Each record was identified as either pre ECCC (01.08.06 to 31.07.07) or post ECCC (01.08.07 to 31.07.08).

Analysis of the DNW numbers (Combs et.al 2007, Fry et.al 2005, Fernandes et.al 1994) and journey time through the ED (Combs et.al 2007, Toncich et.al 2000) were chosen to determine any impact the commencement of the ECCC had on the ED.

*Did Not Wait (DNW)* - A Chi test was undertaken to test whether there was a change in the number of patients who DNW for treatment pre and post the commencement of the ECCC. This was initially applied to all ED patients during the study period and further applied specifically to Triage 4 and Triage 5 patients as they are the target group of the ECCC. Approximately 80% of DNW patients fall into these two triage categories.

Given the ECCC has limited opening hours (0900-1700, seven days per week), DNW numbers were further categorised into open and closed. A higher percentage of both triage 4 and 5 patients did not wait for treatment during the hours when the ECCC was closed (Table 6).

To determine whether there was a difference in this pattern since the commencement of the ECCC, the percentage of DNW numbers for triage 4 and 5 patients were categorised both pre and post ECCC according to the hours the ECCC was open (0900 – 1659) versus closed (1700 – 0859). These hours were consistent with the fast track hours when operating from the main ED prior to the commencement of the ECCC. To analyse whether there was a statistically significant difference, a test for confidence intervals for two proportions was applied.

*Journey length* – the journey length of all patients was measured in minutes from time of arrival to time of departure from ED. Similar to Combs et.al (2007) and Toncich et.al (2000), the median journey time was selected as the most appropriate measure due to the mean being influenced by extreme outliers (Table 7).

To determine if there was a difference in the median journey length of patients though ED pre and post the commencement of the ECCC, statistical testing was undertaken using a non parametric Wilcoxon two-sample test, similar to the Mann-Whitney U-test applied by Toncich et.al (2000). This test was applied to the journey length of all patients and then specifically to those patients with triage categories 4 and 5.

#### Avoidable Admissions

All data relating to inpatients was obtained from the HIE. For the CAPAC service, only data since the commencement of the ECCC (August 07) has been included. The rationale for this is two-fold. Firstly, prior to the ECCC there was no dedicated medical governance for the service – referrals were ad hoc and the service was underutilised. With the commencement of the ECCC, the medical governance for CAPAC was provided by a dedicated, ED CMO who actively promoted the service. This makes comparison problematic as essentially they are different services. Secondly, data was manually collected prior to July 07 and considered part of the non-admitted occasions of service data collection. Therefore, this data was not coded. From July 07, NSW Health required all CAPAC patients to be entered into the Patient Administration System (PAS) to enable coding, however there was a period of transition from manual to electronic data capture. To ensure that all patients were captured, data from the HIE was cross referenced with the manual patient registration log still kept by the CAPAC service. There were 12 admissions to CAPAC in August 07 that were not entered into the PAS. These admissions have been added to the HIE dataset and assigned a DRG with the assistance of the NCAHS Clinical Information Manager. From September 07 all patients were captured in the PAS.



As part of the NSW Health Avoidable Admission strategy, eight DRGs have been identified as clinically appropriate to receive treatment in an alternative to hospital setting (NSW Health 2007). The ECCC provides this alternate setting through the CAPAC and Day Procedure streams of the service. Datasets for the eight DRGs in each of three care settings at PMBH (inpatient, CAPAC and Day Procedures) were reviewed. A descriptive analysis is provided discussing the activity and potential shift of activity from the inpatient setting.

#### Stakeholder Interviews

To ensure that data analysis was considered in local context, semi structured interviews were conducted with key stakeholders at PMBH. Key stakeholders included PMBH General Manager, Director of Nursing, ED Nursing Unit Manager, ECCC CMO and Community & Allied Health Manager. Their professional opinions were sought regarding the impact the ECCC had on PMBH activity as well as any variables which may have influenced the data. Common themes and issues were identified (Appendix 5) and considered throughout the writing of this report.

## RESULTS

The results are presented under the subheadings of the three main activity areas plus stakeholder interviews:

- PMBH organisational activity (inpatient, ED, ECCC and surgical)
- emergency department (DNW, journey length)
- avoidable admission DRGs (inpatients, CAPAC, day procedures)

### ***PMBH Organisational Activity***

#### Inpatient activity

Table 1 Summary table of inpatient activity at PMBH

|                       | pre ECCC | post ECCC | activity difference<br>(post-pre)<br>(%) |
|-----------------------|----------|-----------|--|
| Available beds (n)    | 56472    | 55412     | -1060 (-1.9%)                            |
| Occupied bed days (n) | 47774    | 49592     | 1818 (3.8%)                              |
| Separations (n)       | 12794    | 13985     | 1191 (9.3%)                              |
| Ave bed occupancy (%) | 84.6     | 89.5      | 4.9 (5.8%)                               |
| ALOS (days)           | 3.73     | 3.55      | -0.18 (-4.8%)                            |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)

Table 1 summarises the inpatient activity at PMBH pre and post the establishment of the ECCC. During the study period, activity increased at PMBH with a 3.8% increase in occupied days and a 9.3% increase in separations despite a 1.9% reduction in available bed days. To accommodate this increased activity with less capacity, the average bed occupancy increased (5.8%) and the average length of a patient's stay reduced from 3.73 to 3.55 days.

Activity in PMBH is largely generated through surgery and the emergency department, therefore further analysis of these areas is warranted.

#### Emergency Department Activity

Table 2 Summary table of Emergency Department activity at PMBH

|                 | ED PRESENTATIONS           |                             |  |
|-----------------|----------------------------|-----------------------------|--|
|                 | pre ECCC<br>n (% of total) | post ECCC<br>n (% of total) | activity difference<br>(post-pre)<br>(%) |
| Triage 1        | 134 (0.5%)                 | 158 (0.5%)                  | 24 (17.9%)                               |
| Triage 2        | 2049 (8.1%)                | 2632 (9.1%)                 | 583 (28.5%)                              |
| Triage 3        | 9408 (37.3%)               | 10384 (35.8%)               | 976 (10.4%)                              |
| Triage 4        | 12308 (48.8%)              | 13751 (47.4%)               | 1443 (11.7%)                             |
| Triage 5        | 1332 (5.3%)                | 2068 (7.1%)                 | 736 (55.3%)                              |
| Total           | 25231 (100%)               | 28993 (100%)                | 3762 (14.9%)                             |
| Ward Admissions | 6010 (23.8%)               | 6388 (22.0%)                | 378 (6.3%)                               |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)

Table 2 summarises the activity in the PMBH ED by triage category pre and post the establishment of the ECCC. Ward admissions are those patients who present to the ED and are subsequently admitted as an inpatient. When comparing activity pre and post the commencement of the ECCC, there was an increase in activity in all triage categories. This resulted in a 14.9% increase in activity through the emergency department. When measuring absolute difference, the number of higher acuity patients increased by 28.5% for triage 2 (2049 to 2632) and 10.4% for triage 3 (9408 to 10384).

As a proportion of the total presentations to the ED, the relative difference increased for triage 2 and triage 5 by 1% and 1.8% respectively. Triage 1 remained at 0.5% whilst triage 3 and 4 reduced by 1.5% and 1.4 respectively.

The number of admissions from ED to an inpatient bed increased by 6.3% (6010 to 6388), however as a proportion of total ED presentations the ward admissions decreased (23.8 to 22%).

### ECCC activity

Table 3 Summary table of ECCC activity at PMBH

| ECCC ACTIVITY   |      |
|---|------|
| <b>FAST TRACK</b>                                     |      |
| Triage 2  | 1    |
| Triage 3  | 474  |
| Triage 4  | 4511 |
| Triage 5  | 1183 |
| total   | 6169 |
| % of total ED presentations<br>(during opening hours) | 40.6 |
| % of total ED presentations<br>(all hours)            | 21.3 |
| <b>CAPAC</b>  |      |
| number of patients (all DRGs)                         | 321  |
| number of patients (AA DRGs*)                         | 147  |
| number of reviews in ECCC                             | 471  |
| <b>DAY PROCEDURES</b>                                 |      |
| number of patients                                    | 178  |

Footnote: Aug 07 - Jul 08 (excl. April 08)

\* AA - the eight avoidable admissions as per NSW health (appendix 1)

Table 3 provides a summary of activity in each of the three care streams in the ECCC following establishment in August 2007. This data is collected as a subset of other data sets such as EDIS and the HIE. It does not count the patients again but rather reflects the activity within the ECCC to assist with internal reporting and service planning.

Fast track: these patients have presented to the main ED, been triaged and deemed appropriate to be treated in the ECCC. The majority of patients who are streamed to the fast track service of the ECCC were either triage 4 (73.1%) or triage 5 (19.2%). During the opening hours of the ECCC, 40.6% of all presenting patients to the ED were streamed away from the main emergency department and treated in the ECCC.

CAPAC: this service aims to avoid or minimise the need for hospitalisation. These patients receive most of their care at home with medical assessments and reviews conducted in the ECCC. The patients may be admitted via the ED, from an inpatient bed or directly from the GP or specialist medical officer. Medical governance was provided for 321 CAPAC patients by the CMO of the ECCC. Of these patients, 45.8% were coded in the avoidable admission DRGs. The ECCC provided 471 reviews and treatments to these patients. During the time of the study period, inpatient data and CAPAC data were collected as different ‘facilities’ in the HIE. This meant that if an inpatient was transferred to the CAPAC service for ongoing treatment, it was considered as two separate admissions and therefore coded as separate DRGs. Therefore it was not possible to identify how many admissions to CAPAC within the eight avoidable admission DRGs were a direct substitution of care (hospital avoidance) and how many were a continuation of care (hospital minimisation).

Day Procedures: A total of 178 patients who would previously have been admitted to an inpatient bed were admitted to the ECCC for day procedures. These are booked procedures and come directly to the ECCC.

### Surgical Activity

Table 4 Summary table of surgical activity at PMBH

|                                    | pre ECCC     | post ECCC    | activity difference<br>(post-pre)<br>(%) |
|------------------------------------|--------------|--------------|--|
| Elective (n) (% of total)          | 3084 (59.7%) | 2857 (54.9%) | -227 (-7.4%)                             |
| Emergency (n) (% of total)         | 2083 (40.3%) | 2349 (45.1%) | 266 (12.8%)                              |
| Total (n)                          | 5167         | 5206         | 39 (0.8%)                                |
| Cancellations (day of surgery) (n) | 46           | 224          | 178 (387%)                               |
| Cancellation rate (%)              | 1.43         | 7.55         | 6.1%                                     |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)

Table 4 summarises the elective and emergency surgery activity at PMBH including cancellations of elective cases that occurred on the day of surgery. Whilst there was only a marginal increase in overall surgical activity (0.8%), the major change was the proportion of elective versus emergency surgery. Emergency surgery increased by 12.8% in the post ECCC period, thereby increasing the pressure on beds and reducing the ability to perform elective surgery. Approximately four times more elective patients were cancelled on the day of their surgery in the second year of the study period compared with the previous year. Increasing demand from the emergency department in terms of both number and acuity suggests that this is a factor influencing the increased demand for emergency surgery.

## Emergency Department

### Analysis of Did Not Wait (DNW) data:

Table 5 Patients who did not wait for treatment in the Emergency Department

| PRESENTATIONS               | ALL PATIENTS |               | TRIAGE 4      |               | TRIAGE 5     |              |
|-----------------------------|--------------|---------------|---------------|---------------|--------------|--------------|
|                             | pre ECCC     | post ECCC     | pre ECCC      | post ECCC     | pre ECCC     | post ECCC    |
| treated (n)<br>(% of total) | 24211 (96%)  | 27611 (95.3%) | 11584 (94.1%) | 12868 (93.6%) | 1185 (89.0%) | 1860 (89.9%) |
| DNW (n)<br>(% of total)     | 1020 (4.0%)  | 1382 (4.7%)   | 724 (5.9%)    | 883 (6.4%)    | 147 (11.0%)  | 208 (10.1)   |
| <b>TOTAL</b>                | <b>25231</b> | <b>28993</b>  | <b>12308</b>  | <b>13751</b>  | <b>1332</b>  | <b>2068</b>  |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)

Table 5 provides the number and percentages of patients who did not wait for treatment after presenting to the PMBH ED pre and post the establishment of the ECCC. The overall numbers of DNWs pre and post the commencement of the ECCC were initially analysed. A Chi test returned a p value <0.01 indicating there had been a change to the number of patients who DNW for treatment following the implementation of the ECCC. However the result is influenced by the large numbers of high acuity presentations which do not typically have high DNW numbers. The majority of DNW patients are classified triage 4 or 5. Prior to the ECCC, 85.4% of DNW patients were either T4 or T5 and 78.9% post ECCC.

Given that 90% of patients who receive treatment in the fast track service of the ECCC present as triage 4 or 5, these categories were analysed separately. For the categories of triage 4 and 5, the Chi test returned p values >0.05 (0.07 and 0.36 respectively) indicating that there was no change in the number of patients who did not wait for treatment in either triage 4 or triage 5 categories following the commencement of the ECCC. However, triage 4 was borderline significant indicating there may be some change in this category.

The ECCC is open seven days per week between 0900 and 1700. Further analysis was undertaken on the DNW numbers to determine if there was any difference in the proportions of DNW when the service was opened compared to when it was closed. These hours were consistent with the hours the fast track service was operating from the main ED prior to the ECCC.

Table 6 Comparison of percentage of DNW for triage 4 and 5 between hours when fast track service open vs closed

| HOURS OF SERVICE     | TRIAGE 4<br>% of patients who DNW |           | TRIAGE 5<br>% of patients who DNW |           |
|----------------------|-----------------------------------|-----------|-----------------------------------|-----------|
|                      | pre ECCC                          | post ECCC | pre ECCC                          | post ECCC |
| open (0900 -1659)    | 4.4                               | 3.8       | 9.3                               | 6.8       |
| closed (1700 - 0859) | 7.6                               | 9.8       | 13.2                              | 17.4      |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)

Table 6 compares the percentage of T4 and T5 patients who DNW for treatment pre and post ECCC categorised into the hours the fast track service operates compared to when the service is closed. This table illustrates a reduction in the proportion of patients during opening hours who DNW for treatment in both triage 4 and 5 categories since the commencement of the ECCC. However, the proportion during the closed hours has increased post ECCC.

Regardless of whether it is pre or post ECCC, the proportion of DNWs in both triage 4 and 5 categories is consistently lower during the opening hours. To determine if there has been any change in the pattern of patients not waiting for treatment since the ECCC opened, a confidence interval for two proportions test was applied to each of the triage categories.

#### Triage 4:

Prior to the opening of the ECCC, 3.3% (4.4% to 7.6%) more triage 4 patients DNW between the hours 1700 and 0859 (closed) than between the hours of 0900 and 1659 (open) with a 95% confidence interval of 2.41 to 4.11%.

Following the commencement of the ECCC, 6.0% (3.8% to 9.8%) more triage 4 patients DNW during the closed hours compared to the open hours with a 95% confidence interval of 5.2 to 6.9%.

The confidence intervals do not overlap, indicating a statistical difference between the proportions of triage 4 patients who DNW between open and closed and pre and post ECCC.

#### Triage 5:

Prior to the opening of the ECCC, 3.9% (9.3% to 13.2%) more triage 5 patients DNW between the hours 1700 and 0859 (closed) than between the hours of 0900 and 1659 (open) with a 95% confidence interval of 0.55 to 7.41%

Following the commencement of the ECCC, 10.6% (6.8% to 17.4%) more triage 5 patients DNW during the closed hours compared to the open hours with a 95% confidence interval of 7.41 to 13.81%.

Again, the confidence intervals do not overlap, indicating a statistical difference between the proportions of triage 5 patients who DNW between open and closed and pre and post ECCC.

#### Analysis of ED journey length

Each patient journey was measured in minutes from the time of arrival to the time of discharge from ED. Tables 7, 8 and 9 provide the summary statistics for all ED patients pre and post the ECCC, and then specifically for the triage 4 and triage 5 categories. Due to the non-normal shape of the patient journey time distribution which includes occasional extreme values, a non parametric Wilcoxon Two-sample test was conducted, firstly on all patients presenting to the ED and then specifically for triage 4 and triage 5 categories.

Table 7 Summary statistics of journey length in minutes of all patients through PMBH ED

| JOURNEY LENGTH IN MINUTES - ALL PATIENTS |                             |                              |
|--|-----------------------------|------------------------------|
|  | pre ECCC<br><i>n</i> =25231 | post ECCC<br><i>n</i> =28993 |
| mean                                     | 246                         | 250                          |
| median                                   | 160                         | 163                          |
| st dev                                   | 280                         | 281                          |
| IQR                                      | 238                         | 251                          |
| min                                      | 0                           | 0                            |
| max                                      | 4426                        | 8674                         |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)

The Wilcoxon Two-sample test gave a p value = 0.0288 indicating there is a statistically significant difference in the medians in the period prior to the ECCC compared to the same period following the ECCC.

Table 8 Summary statistics of journey length in minutes of Triage 4 patients through PMBH ED

| JOURNEY LENGTH IN MINUTES - TRIAGE 4 |                            |                             |
|--------------------------------------|----------------------------|-----------------------------|
|                                      | pre ECCC<br><i>n=12309</i> | post ECCC<br><i>n=13751</i> |
| mean                                 | 209                        | 203                         |
| median                               | 128                        | 121                         |
| st dev                               | 256                        | 255                         |
| IQR                                  | 194                        | 192                         |
| min                                  | 0                          | 0                           |
| max                                  | 3862                       | 8674                        |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)

The Wilcoxon two-sample test was repeated for all triage 4 patients (p value = 0.1765) indicating there was no statistically significant difference in medians pre and post ECCC for triage 4 patients.

Table 9 Summary statistics of journey length in minutes of Triage 5 patients through PMBH ED

| JOURNEY LENGTH IN MINUTES - TRIAGE 5 |                           |                            |
|--------------------------------------|---------------------------|----------------------------|
|                                      | pre ECCC<br><i>n=1332</i> | post ECCC<br><i>n=2068</i> |
| mean                                 | 75                        | 67                         |
| median                               | 44                        | 40                         |
| st dev                               | 115                       | 92                         |
| IQR                                  | 79                        | 55                         |
| min                                  | 0                         | 0                          |
| max                                  | 1640                      | 1610                       |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)

For triage 5 patients, the Wilcoxon Two-sample p value = 0.9617 which indicates there was no statistical difference in the medians for triage 5 patients' pre and post the commencement of the ECCC.

## Avoidable Admission DRGs

### Analysis of Inpatient Data

Table 10 Avoidable admission DRGs with highest rate of admissions and bed day usage admitted as inpatients pre and post ECCC

|      |  | INPATIENT         |                             |                      |                   |                             |                      |                             |
|------|--|-------------------|-----------------------------|----------------------|-------------------|-----------------------------|----------------------|-----------------------------|
|      |  | pre ECCC          |                             |                      | post ECCC         |                             |                      |                             |
| DRG  | Description                                  | admissions $\eta$ | length of stay (total days) | length of stay (ave) | admissions $\eta$ | length of stay (total days) | length of stay (ave) | Difference (post-pre) n (%) |
| J64B | Cellulitis                                   | 156               | 483                         | 3.10                 | 108               | 367                         | 3.40                 | -48 (-30.8)                 |
| E62C | Community Aquired Pnuemonia                  | 105               | 362                         | 3.45                 | 110               | 383                         | 3.48                 | 5 (4.8)                     |
| E65B | Chronic obstructive pulmonary disease (COPD) | 83                | 368                         | 4.43                 | 97                | 562                         | 5.79                 | 14 (16.9)                   |
| E69C | Bronchitis/asthma <50yrs                     | 103               | 169                         | 1.64                 | 90                | 171                         | 1.90                 | -13 (-12.6)                 |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)

Table 10 describes the number and length of stay for patients with an Avoidable Admission DRG admitted to an inpatient bed at PMBH, pre and post ECCC. Of the eight avoidable admission DRGs, the highest number of admissions and bed days are attributable to the four DRGs listed in the above table. (A table showing the results of all eight DRGs is provided in Appendix 6). Admissions to an inpatient bed for the treatment of cellulitis (J64B) have decreased by 30.8% with a reduction of 116 bed days. Whilst bronchitis and asthma (E69C) has decreased in admission numbers, there has been no corresponding reduction in bed day usage. The average length of stay has increased for all four DRGs, in particular COPD (E65B) with an increase of 1.36 days and clearly has the highest bed day usage of all the avoidable admission DRGs.



## Analysis of CAPAC data

Table 11 Avoidable admission DRGs treated by the CAPAC service

| DRG  | Description                            | post ECCC         |                                |                         |
|------|--|-------------------|--------------------------------|-------------------------|
|      |  | admissions<br>(n) | length of stay<br>(total days) | length of stay<br>(ave) |
| J64B | Cellulitis                             | 90                | 560                            | 6.22                    |
| E62C | Respiratory<br>Infection               | 22                | 112                            | 5.09                    |
| F63B | Venous<br>Thrombosis                   | 29                | 144                            | 4.97                    |
| E65B | Chronic obstructive<br>airways disease | 5                 | 37                             | 7.40                    |
| E69C | Bronchitis/asthma<br><50yrs            | 0                 | 0                              | 0.00                    |
| I71C | Musculotendinous<br>disorders <70      | 0                 | 0                              | 0.00                    |
| L67C | Kidney & urinary tract<br>diagnosis    | 1                 | 3                              | 3.00                    |
| Q61C | Red blood cell<br>disorders            | 0                 | 0                              | 0.00                    |

Footnotes: post ECCC (Aug 07 - Jul 08 excl. April 08) ie. medical governance commenced Aug 07

Table 11 illustrates the number and length of stay of patients within the eight avoidable admission DRGs that were admitted to the CAPAC post ECCC (ie. when medical governance for the CAPAC service was commenced). Three of the eight avoidable admission DRGs are regularly admitted to the CAPAC service with Cellulitis (J64B) being the most common with 90 admissions. Community Acquired Pneumonia (E62C) and DVT (F63B) are also regularly admitted to CAPAC with 22 and 29 admissions respectively.

Only five patients with COPD (E65B) were admitted to CAPAC despite being the highest user of inpatient beds in the eight avoidable admission DRGS. No patients with bronchitis/asthma (E69C) were admitted to CAPAC.

The ALOS for each of the avoidable admission DRGs admitted to CAPAC is longer than as an inpatient for the comparable time period. For example, Cellulitis (J64B) has an ALOS of 6.22 days as a CAPAC patient compared to 3.4 days as an inpatient.

## Analysis of Day Procedure data

Analysis of the DRG data for the day procedure service located as part of the ECCC showed that only one of the avoidable admission DRGs was relevant being red blood cell disorders ie. transfusions (Q61C)

Table 12 Avoidable admission DRGs treated as inpatients and as day procedures in the ECCC

| DRG  | Description                             | DAY PROCEDURES (INPATIENT) |                                   |                         |                 |                                   | DAY PROCEDURES (ECCC)   |                 |                                   |                         |
|------|---|----------------------------|-----------------------------------|-------------------------|-----------------|-----------------------------------|-------------------------|-----------------|-----------------------------------|-------------------------|
|      |   | pre ECCC                   |                                   |                         | post ECCC       |                                   | post ECCC               |                 |                                   |                         |
|      |   | admissions<br>n            | length of<br>stay (total<br>days) | length of<br>stay (ave) | admissions<br>n | length of<br>stay (total<br>days) | length of<br>stay (ave) | admissions<br>n | length of<br>stay (total<br>days) | length of<br>stay (ave) |
| Q61C | Red blood cell disorders (transfusions) | 73                         | 116                               | 1.59                    | 69              | 96                                | 1.39                    | 66              | 66                                | 1.00                    |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)

Table 12 describes the activity of patients receiving red blood cell transfusions (Q61C) pre and post ECCC as inpatients and as day procedures in the ECCC. There was only a marginal reduction of four admissions in the number of inpatients with the DRG Q61C in the post ECCC period compared to pre ECCC. Sixty six patients received transfusions as day procedures in the ECCC. The ALOS as inpatients is greater than one day which would exclude admission criteria to the ECCC, however on further analysis of the data, 56 of the 69 patients in the post ECCC period had a LOS of 1.0.

## **Stakeholder Interviews**

The interviews conducted with key stakeholders gave valuable information to ensure the data was analysed and interpreted with consideration to local context. The major theme emerging from the interviews was the perception that the ECCC had helped with the congestion in the ED. This included less congestion in the ED waiting room and reduction in aggression towards the staff. In addition it was felt that the number of patients that DNW for treatment decreased when the service was open.

Medical governance for the CAPAC service was considered a major factor in the success of the ECCC. All stakeholders conceded the service was underutilised prior to the ECCC as there was no consistent and identifiable medical governance.

All those interviewed agreed that the strategy of combining the acute service with the community services of the CAPAC had worked however extending the service hours of the ECCC would increase the benefits. It was felt that the gains were temporary and more was required to manage growth into the future.

## **DISCUSSION**

The aim of this study was to evaluate how the establishment of the ECCC impacted on the activity of PMBH. The evaluation focused on the ED and the avoidable admission DRGs as determined by NSW Health. Against a backdrop of increasing activity, the ECCC has allowed the ED to maintain services to triage 4 and 5 patients; provided the beginnings of practice change for avoidable admissions; and increased capacity for treating patients with avoidable admission DRGs in an alternative care setting.

### ***PMBH Organisational Activity***

The ECCC was established to help address the increasing demands being placed on both the ED and the inpatient beds. During the study period, the overall activity data indicates an increase in both inpatient activity and emergency department presentations. This illustrates the pressure that the organisation was under (and still is) to meet the demand for health care in its district. Inpatients, measured by separations, increased by 9.3% and required an increased number of bed days however less bed days (-1.9%) were available. To meet this demand, the overall occupancy rate increased by 5.8% to 89.5%, and patient turnover was quicker with a reduction in ALOS by 4.8%.

The increasing volume of higher acuity triage 2 (28.5%) and triage 3 (10.4%) patients added further pressure to the organisation. Higher acuity patients require more intervention and treatment therefore occupying the treatment spaces for longer periods and were more likely to be admitted (6.3% increase in ward admissions from ED). The diversion of 40.6% of patients to the ECCC during the opening hours alleviated the 'pressure cooker' effect that built up in the waiting room and the limited treatment areas, however it was noted that the pressure increased again once the ECCC was closed.

Total surgery numbers were relatively stable over the study period, however there was a shift in the proportions of emergency versus elective surgery. Post ECCC, the proportion of emergency surgery increased by 4.8% to 45.1%. Theatre utilisation figures were not available as PMBH did not have an electronic surgical information management system during the study period, however stakeholders reported that the theatres were operating at capacity (within allocated resources). The increased activity and acuity in ED combined with a 6% increase in the cancellation rate for elective surgery, suggests that emergency surgery required by ED patients was managed by cancelling already scheduled elective cases. The cancellation of elective cases may also be a necessary bed management strategy to 'free up' beds for those awaiting admission in the ED.

### ***Emergency Department***

The limited physical capacity of the PMBH ED was a key driver in establishing the ECCC. The ED was originally designed for 14,000 presentations and in the year prior to the ECCC received more than 25,000 presentations. Interviews with the key stakeholders indicated one of the major pressures on the ED was limited space in both the ED treatment areas and waiting room.

Comparison of the number and proportion of patients who did not wait for treatment (DNW) and the length of the patients' journey through the ED were chosen to determine if there was a statistically significant difference pre and post the establishment of the ECCC. Patients in triage categories 4 and 5 were analysed separately as these comprise 92% of the fast track service in the ECCC. (Table 3)

### Patients who Did Not Wait for treatment (DNW):

Patients who do not wait for treatment have an increased clinical risk. Therefore, this indicator is valid when assessing organisational risk (Fry et.al 2005). The percentage of DNWs, when including all ED presentations, showed a significant increase. This is influenced however by the large number of patients in the higher acuity triage categories which typically do not have high percentages of DNW. Therefore, the results relating to triage 4 and 5 are more relevant as these are the target group for the ECCC.

When comparing the periods pre and post the commencement of the ECCC, there is no statistical difference in the number of triage 4 and 5 patients who did not wait for treatment. This is not surprising as the fast track service was operational during both study periods – it was the location that differed. However, it is noted that the service maintained their performance level, despite the 11.7% increase in Triage 4 category presentations and 55.3% increase in Triage 5 category presentations over the study period. Considering the physical constraints of the ED, it is likely that without the ECCC, the number of DNWs for these categories would have risen during the post period.

Interviews with the key stakeholders indicate the benefits of the ECCC can be subtle and hard to quantify using the outcome measures currently available. For example, when the ECCC is open, the ED waiting room is less crowded with 40.6% of patients actively streamed to the ECCC which reduces the levels of agitation and patients are less likely to become frustrated.

A greater proportion of triage 4 and 5 patients chose not to wait for treatment in the ED during the hours when the ECCC was closed. There was a statistical difference in the DNW proportions for both triage 4 and 5 patients, between open and closed hours when comparing pre and post ECCC. This suggests a change in behaviour of the patients presenting in these categories. A possible explanation is that once the ECCC became an established and guaranteed service, patients were less likely to wait for more minor presentations knowing they can return the next day and be streamed straight to the ECCC. This information may be useful in planning service enhancements and assessing the organisation's risk associated with the clinical risk of DNW.

### Journey length of ED patients

The median journey time for all patients through the ED increased by three minutes when comparing the periods pre and post ECCC. While this is a statistically significant difference ( $p=0.02288$ ), probably due to the very large sample size, it is unlikely to be considered a clinically significant result.

While both triage 4 and 5 categories reduced their median journey lengths by seven and four minutes respectively, these reductions were not statistically significant. It does demonstrate however, a change in the right direction and should be considered in the context that the number of triage 4 and 5 presentations increased by 11.7% and 55.3% respectively post ECCC. Journey lengths have held their pre ECCC performance which suggests that the fast track service in the ECCC has contributed to the emergency departments' ability to cope with the increasing demand.

## ***Avoidable Admissions***

NSW Health (2007) identified eight DRGs as amenable to receiving care in a setting other than an acute inpatient bed. The ECCC provides two such alternative care settings with the CAPAC and the day procedure service. An analysis of inpatient data as well as the CAPAC and day procedure data of these eight DRGs was undertaken. A limitation of this analysis is that CAPAC data was not coded prior to the ECCC, therefore comment is provided only on this activity post ECCC.

Cellulitis shows the most notable change. Prior to the ECCC, cellulitis had the highest inpatient admission rate of the eight DRGs with 156 admissions. Inpatient admissions decreased by 30.8% (48) in the post ECCC period. Ninety admissions were treated in the CAPAC with this DRG which suggests a change in practice to admit cellulitis patients directly to the CAPAC. This is further supported as cellulitis was a targeted presenting condition in the ED when the ECCC was established. The ALOS has risen from 3.1 to 3.4 days. This suggests that those that are admitted have co-morbidities or other influencing factors that increase the length of stay and would be less suited to care in the home setting.

Chronic obstructive pulmonary disease (COPD) has the highest inpatient bed usage. Admissions to an inpatient bed increased by 14 in the post ECCC period and occupied 562 bed days. Only 5 patients with COPD were admitted to the CAPAC service. Given the high usage of inpatient beds, this group of patients may benefit from a targeted program by the CAPAC service to encourage earlier discharge from hospital or admission directly from ED or General Practitioners (GPs).

Bronchitis/asthma <50yrs has reduced the admission rate by 12.6% though bed days remained stable. The resulting increase in ALOS suggests other influencing factors which could support an inpatient admission rather than suitability for CAPAC, however there were no admissions to CAPAC with this DRG. This group of patients may present an opportunity for additional bed day savings.

Community acquired pneumonia showed minimal difference in the numbers of admissions or the length of stay of patients between pre and post ECCC. Twenty two patients were seen in the CAPAC which may suggest this service has provided increased capacity however without comparison to pre ECCC CAPAC data it is difficult to draw conclusions. Similar to bronchitis and asthma <50yrs, this group of patients may also provide opportunity for bed day savings.

The data indicates there is minimal activity in the CAPAC service for the respiratory avoidable admission DRGs. There appears to be scope for an increased number of patients with respiratory illnesses to be cared for by the CAPAC team. Further analysis to ascertain if there are any issues relating to the transfer of care to the CAPAC service would be beneficial.

Venous thrombosis (DVT) has been managed for some years by primary care services. The low number of inpatients and CAPAC patients with this condition supports this. The increasing inpatient ALOS suggests that these patients have influencing factors which support an admission to an acute hospital bed.

The ALOS for the above DRGs admitted to the CAPAC service is longer than those admitted as inpatients. In the absence of total length of care data, it is not possible to determine if a percentage of inpatients have a reduced length of stay because they are transferred to the CAPAC service and would otherwise have been in hospital longer.

Prior to the ECCC, patients requiring transfusions for red blood cell disorders were admitted to an inpatient bed, usually the day surgery unit. Some transfusions were given in the ED. The aim of providing this service in the ECCC was to free up the acute inpatient beds and increase inpatient capacity. The data indicates that little movement has occurred within the inpatient setting for transfusions for red blood cell disorders with four fewer admissions since the introduction of the ECCC. However 66 patients requiring transfusions for red blood cell disorders received transfusions in the ECCC as day procedures which suggests the ECCC has created more capacity rather than changing practice and avoiding admission. Fifty six of the 69 patients who were admitted to an acute bed during the post ECCC period had a length of stay

of 1.0 day. This suggests that an opportunity still exists to reduce the number of inpatients receiving transfusions and have their care provided in the ECCC.

### **Limitations**

This comparison does not take into account year to year variability in hospital activity outside the two year study period. The change of ownership of PMBH from a private hospital contracted to provide some public health services, to a NSW Health public hospital in February 2005 is likely to have affected year to year variability. Whilst this is outside the study period for this evaluation, it is probable that the accessibility to services that public health provides may influence the presentation and activity patterns for a few years following the change.

This analysis does not identify whether the increased capacity resulting from the ECCC has provided services for previous unmet demand (ie. people who needed health services but who did not access them); serviced new demand due to the increasing population; or generated demand because the capacity now exists.

### **CONCLUSION**

The aim of this study was to determine what impact the establishment of the ECCC had on PMBH. General activity data, when comparing the 11 month periods pre and post the commencement of the ECCC, demonstrates growth in most areas, in particular the emergency department. It is against this backdrop of increasing demand and activity that further analysis of the emergency department and the 8 avoidable admissions DRGs was undertaken.

The establishment of the ECCC has created additional capacity at PMBH and demonstrated that the adaptation of best practice models to fit local context has been successful in the Port Macquarie Base Hospital.

There was no significant statistical difference in either the median journey length or the number of DNW patients pre and post ECCC. However, given the growth in presentations to ED in the post ECCC period, the fact that these performance measures were maintained supports the argument that the ECCC provided additional ED capacity by treating more than 40% of ED presentations during opening hours.

There is a statistical difference in the DNW proportions for both triage 4 and 5 patients, between open and closed hours when comparing pre and post ECCC. This suggests a change in behaviour of patients not waiting for treatment since the introduction of the ECCC. The increased proportion of patients not waiting for treatment during the hours the service is closed suggests that now people are aware they can be seen the next day in the ECCC, they choose not to wait and may represent the following day.

With the exception of patients being treated for cellulitis, there were only marginal differences when comparing inpatient numbers pre and post ECCC for the remainder of the 8 avoidable admission DRGs. The 30% reduction in admissions for cellulitis and a high number of admissions in CAPAC for the same DRG suggests a change in clinical practice for this group of patients. In the absence of CAPAC data prior to the ECCC, it is difficult to know whether the patients seen by the CAPAC service within the remaining DRGs indicates increased capacity or 'normal' business. It is, however generally acknowledged that the CAPAC service was underutilised prior to medical governance being provided through the establishment of the ECCC. This would suggest, though not quantifiable, that the general increase in CAPAC numbers post ECCC has provided acute bed capacity for PMBH. The ECCC has provided increased capacity for patients receiving transfusions for red blood cell disorders.

The ECCC, through the fast track service has provided increased capacity at PMBH for the emergency department by maintaining key performance measures despite physical constraints and significant increases in activity. The CAPAC service has provided increased capacity in both acute inpatient beds and alternative to hospital services. With the exception of cellulitis, there has not been a reduction in avoidable admissions. In the words of one key stakeholder “the ECCC cannot hold back the tide, but it has bought us some time”.

## **RECOMMENDATIONS**

1. Increase the opening hours of the ECCC as this is likely to
  - create further capacity in the ED.
  - reduce clinical risk as the results of this study indicate that DNW numbers reduce when the service is open.
  - reduce journey lengths further given the current operating hours have maintained the journey length despite increased activity.
2. Implement a targeted program to increase the number of respiratory patients admitted to CAPAC, in particular the respiratory avoidable admission DRGs. The reduction of patients admitted to a hospital bed for the treatment of cellulitis suggests this approach is successful in changing clinical practice.
3. Reduce the number of inpatients receiving transfusions in a ward bed by providing their care in the ECCC. Fifty six of the 69 patients who were admitted to an acute bed during the post ECCC period had a length of stay of 1.0 day, suggesting these patients may have been suitable for treatment in the ECCC.

## **SCOPE FOR FURTHER STUDY**

### **Emergency Department**

Since the establishment of the ECCC, the proportion of DNW patients between when the service is open and closed has changed. It is suggested that people are not as inclined to wait for treatment for more minor illnesses if they know they can represent the next day and in all probability be seen quicker. To provide information to assess the organisational risk associated with the clinical risk of DNW patients, further analysis of these patients may be useful including how many represented, did their acuity increase, how many did not return for treatment and where did they go?

Triage 5 presentations increased 55% in the post ECCC period. Further analysis of the presenting problems of triage 5 presentations may determine how many of these presentations are appropriate for ED treatment or whether this is a shift from primary care usually provided by GPs. If it is a shift from primary care, it would be beneficial for planning purposes to explore the reasons, for example is it access to GPs or the costs associated.

Analysis of ED journey times indicated a slight decrease in the median journey time of triage 4 (seven mins) and triage 5 (four mins) patients. Although these are not statistically significant it demonstrates a change in the right direction despite increasing activity. Analysis of a further 12 months would demonstrate whether this change was sustained and perhaps improved further given the service is now well established.

### **Avoidable Admissions**

Data collection methods limited the ability to track patients from the inpatient to the CAPAC setting, therefore it was not possible to determine total length of care. Since this study period

ended, data collection has changed in response to the NSW Health requirement to capture total length of care (NSW Health 2004). Analysis of total length of care would inform further study into the cost effectiveness of this service.

Patients with an avoidable admission DRG comprised 45.8% of patients admitted to the CAPAC service (Table 3). Further DRG analysis of the remaining 54.2% of patients may be beneficial in identifying groups of patients that are suitable for CAPAC.

### **Surgery**

Cancellation rates of elective surgical cases increased four fold in the post ECCC period to accommodate the increasing emergency surgery. There may be opportunity to review the overall theatre list to include regular, scheduled trauma/emergency lists which would reduce the need for cancellation of elective cases.



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## **APPENDICES**

1. NSW Health Avoidable admission DRGs
2. Population projections for Port Macquarie (Hastings LGA)
3. ECCC flow chart (diagram)
4. ECCC patient flow and ED patient flow(word document)
5. Stakeholder Interviews – common themes
6. Table of Avoidable Admission DRGs for inpatients and CAPAC

## **Appendix 1**

### NSW Health Avoidable admission DRGs

- ◇ Cellulitis (DRG: J64B)
- ◇ Community acquired pneumonia (DRG: E62C)
- ◇ Chronic Obstructive Pulmonary Disease (DRG: E65B)
- ◇ Bronchitis and asthma (DRG: E69C)
- ◇ Red blood cell disorders and Transfusions (DRG: Q61C)
- ◇ DVT (DRG: F63B)
- ◇ Kidney and urinary tract disorders (DRG: L67C)
- ◇ Acute non-surgical pain (musculotendinous disorders) (DRG: I71C)

Source: NSW Health 2007 - Avoidable Admissions preamble

[http://www.archi.net.au/documents/avoidable\\_admission/avoidable\\_admissions\\_preamble.pdf](http://www.archi.net.au/documents/avoidable_admission/avoidable_admissions_preamble.pdf)

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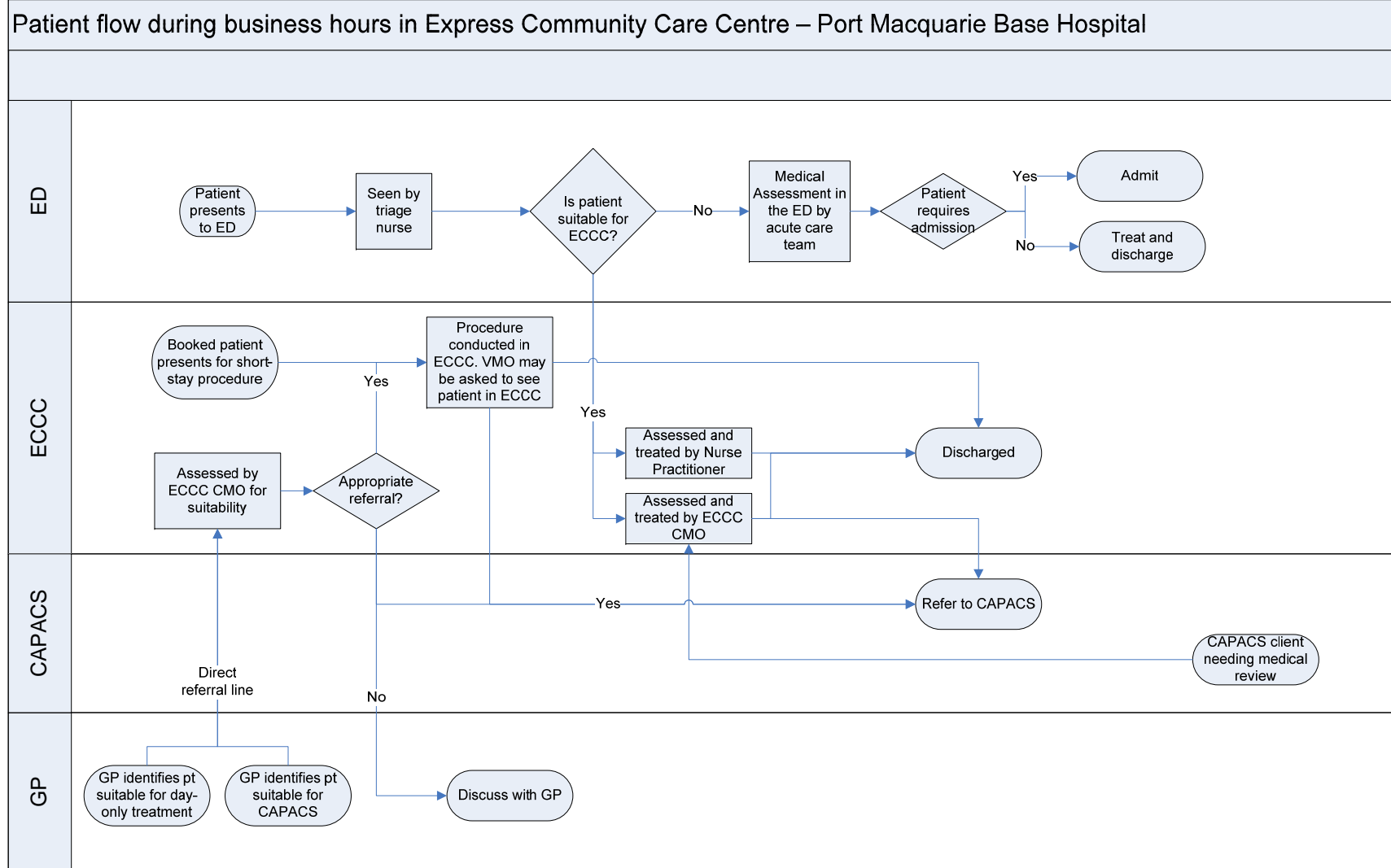
## Appendix 2

### Population projections for Port Macquarie (Hastings)

| Projected average annual growth rate 2006 - 2011 |              |        |
|--|--------------|--------|
| Age group  | Hastings LGA | NSW    |
| 0 - 14 yrs                                       | -0.14%       | -0.37% |
| 15 - 44 yrs                                      | 0.69%        | 0.40%  |
| 45 - 64 yrs                                      | 2.47%        | 1.67%  |
| 65 - 84 yrs                                      | 3.25%        | 2.03%  |
| 85+ yrs  | 5.53%        | 5.03%  |
| Total  | 1.72%        | 0.86%  |

Source: North Coast Area Health Profile 2009 <http://www.ncahs.nsw.gov.au/health-profile>  
[Accessed May 2009]

### Appendix 3 ECCC Flowchart 1



## Appendix 4

### ECCC Patient Flow

Main pathways for referral to and discharge from the ECCC:

NB. This document identifies the most common referral and discharge routes. The word discharge in this context refers to where the patient moves to (flow) rather than the data definition of discharge

#### Fast Track

Referral points:

1. emergency department

Discharge:

1. home
2. emergency department (main)
3. admitted as inpatient
4. admitted to CAPAC

#### CAPAC

Referral points:

1. emergency department
2. fast track within ECCC
3. inpatient units
4. direct referral from GP/specialist

Discharge:

1. home
2. inpatient (admitted to hospital)
3. emergency department
4. deceased

#### Day Procedure

Referral points:

1. inpatient units (follow up care following an inpatient episode)
2. emergency department
3. direct referral from GP/specialist

Discharge:

1. home
2. emergency department
3. inpatient (admitted to hospital)

## **EMERGENCY DEPARTMENT (ED) PATIENT FLOW**

Main pathways for referral to and discharge from the ED:

NB. This document identifies the most common referral and discharge routes. The word discharge in this context refers to where the patient moves to (flow) rather than the data definition of discharge

Referral points (presentation):

1. self presentation
2. ambulance
3. GP/specialist
4. ECCC (day procedures)
5. ECCC (fast track)
6. ECCC (CAPAC)

Discharge:

1. home (with or without follow up)
2. inpatient (admitted to hospital)
3. CAPAC (ECCC)
4. Fast track (ECCC)
5. Day Procedures (ECCC)
6. transfer to another facility
7. Deceased
8. Did not wait for treatment



## Appendix 5

### Stakeholder Interviews – common themes

1. Current ED built for 14,000 presentations annually – now have 30,000+
2. ECCC has helped with the congestion in the ED – those that work there feel that is mainly the congestion in the waiting room and the resulting aggression has been reduced
3. Generally feel that services for T4 and T5 presentations have improved
4. DNWs have reduced during ECCC opening hours – not known whether they increase at other times
5. It is not really known whether the day procedures now being done in the ECCC have only increased the number of patients receiving those services or whether there has been a true shift and there are now ‘other’ types of patients in those beds
6. The expansion of the CAPAC service and most importantly the addition of medical governance has assisted with bed pressures. The direct referrals from ED and the GPs has freed up beds for more acute patients
7. This service has only bought temporary relief to the organisation – the population growth continues and so with it the increasing demand on the health services
8. Fast track was already in place for 12 months prior to ECCC – just changed location and added the other services
9. The hours of the service need to be increased until at least 8pm
10. During the time period of the study, a major GP clinic was closed for six months however there is debate as to how much this affected the service as all but one GP went and worked for other surgeries. If there was any impact it is likely to have been for patients who did not have a GP and needed to come back for follow up appointments to the ECCC as all GP at that time were not taking any new patients. (Hastings Division of GPs state there was a net loss of one GP for one day per week)
11. The voluntary mental health unit was closed for a period of time for refurbishment however no-one spoke of any undue impact – community services were increased during that time

## Appendix 6

Table of Avoidable Admission DRGs for inpatients and CAPAC

| DRG  | Description                         | INPATIENT         |                             |                      |                   |                             |                      | CAPAC             |                             |                      |  |
|------|-------------------------------------|-------------------|-----------------------------|----------------------|-------------------|-----------------------------|----------------------|-------------------|-----------------------------|----------------------|--|
|      |                                     | pre ECCC          |                             |                      | post ECCC         |                             |                      | post ECCC         |                             |                      |  |
|      |                                     | admissions $\eta$ | length of stay (total days) | length of stay (ave) | admissions $\eta$ | length of stay (total days) | length of stay (ave) | admissions $\eta$ | length of stay (total days) | length of stay (ave) |  |
| J64B | Cellulitis                          | 156               | 483                         | 3.10                 | 108               | 367                         | 3.40                 | 90                | 560                         | 6.22                 |  |
| E62C | Respiratory Infection               | 105               | 362                         | 3.45                 | 110               | 383                         | 3.48                 | 22                | 112                         | 5.09                 |  |
| F63B | Venous Thrombosis                   | 24                | 50                          | 2.08                 | 21                | 68                          | 3.24                 | 29                | 144                         | 4.97                 |  |
| E65B | Chronic obstructive airways disease | 83                | 368                         | 4.43                 | 97                | 562                         | 5.79                 | 5                 | 37                          | 7.40                 |  |
| E69C | Bronchitis/asthma <50yrs            | 103               | 169                         | 1.64                 | 90                | 171                         | 1.90                 | 0                 | 0                           | 0.00                 |  |
| I71C | Musculotendinous disorders <70      | 14                | 18                          | 1.29                 | 10                | 12                          | 1.20                 | 0                 | 0                           | 0.00                 |  |
| L67C | Kidney & urinary tract diagnosis    | 59                | 124                         | 2.10                 | 51                | 133                         | 2.61                 | 1                 | 3                           | 3.00                 |  |
| Q61C | Red blood cell disorders            | 73                | 116                         | 1.59                 | 77                | 104                         | 1.35                 | 0                 | 0                           | 0.00                 |  |

Footnotes: pre ECCC (Aug 06 - Jul 07 excl. April 07) post ECCC (Aug 07 - Jul 08 excl. April 08)