

Aeromedical patient transfers from the Balfour Hospital, Orkney

A study of demographic, clinical and operational characteristics

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The Ring of Brodgar at night (D Swerdlow, January 2013)



1 Introduction

1.1 Remote and rural healthcare in the UK

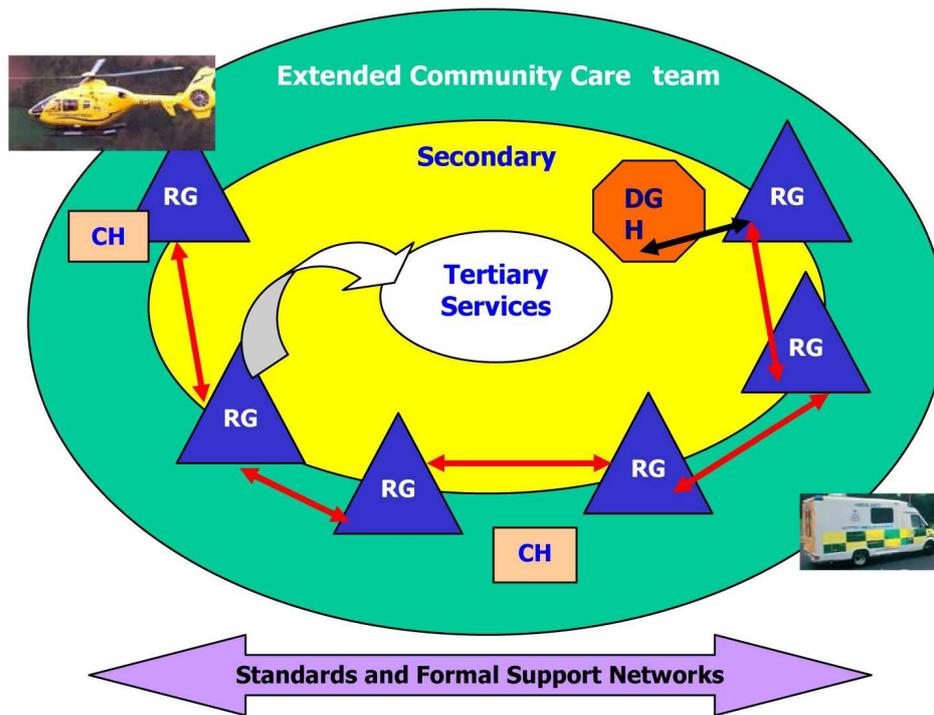
Acute medical care for many remote communities in the UK is delivered in rural general hospitals (RGHs). These provide a range of acute services, and often share patient care with allied larger regional centres, which offer a more comprehensive and intensive level of care and investigation. In Scotland, six RGHs are part of a close network of community healthcare and other tertiary and secondary care providers (Figure 1) that seeks to meet the needs of the remote and rural population (NHS Scotland, 2007, 2010).

Figure 1: Service model for remote and rural healthcare in Scotland (From NHS Scotland 2010) CH - community hospital; RG - rural general hospital; DGH - district general hospital

1.2 The Balfour Hospital, Orkney

The Balfour Hospital, located in Kirkwall, Orkney, is a RGH and is the sole provider of acute medical, surgical and obstetric services to a population of 20,000 people distributed over 17 inhabited islands to the north of Scotland (Figure 2). Surgical, anaesthetic, and maternity care are provided by consultants in those specialties, and by dedicated nursing and midwifery teams respectively. The medical service is delivered by a team of acute hospital general practitioners (GPs) and specialty trainees in general practice. In addition to providing GP training, the Balfour Hospital hosts medical students from the University of Aberdeen, and student nurses and midwives from Robert Gordon University.

Acute presentations are handled initially by the hospital emergency department. Definitive management is commenced either within the Balfour or, if necessary, patients are transferred by air to a tertiary centre on the Scottish mainland. Transfer of patients is undertaken for a variety of reasons. The Balfour has limited capabilities for imaging (only plain x-ray and ultrasound scanning are available) and intensive care (a two-bed high dependency unit), therefore patients requiring further imaging, a higher level of critical care, or other specialist services (e.g. cardiac catheterisation) are transferred. Moreover, all children requiring inpatient management are transferred since there is no paediatric service in Orkney, as are adult patients requiring more complex medical or surgical intervention. Patients transferred to other hospitals are either



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Figure 2: The Orkney Islands managed there for the whole of the index episode, or return to the Balfour for further care once

the intervention or investigation necessitating transfer is complete.

1.3 Rationale and aims

Relatively little evidence exists about the characteristics of patients transferred from remote hospital like the Balfour, the operational circumstances of patient transfers, and the implications of those factors for medical service delivery and planning in the remote setting. Much of the evidence is from outside the UK, and from areas with geography or populations not reliably comparable with those of rural Scotland. The aim of this project is to describe and evaluate the features of the group of patients transferred from a Scottish acute RGH to tertiary centres in a one-year period. In light of its findings, strategies are explored for optimising decision-making around the need for transfer, and the care of patients in the rural setting prior to transfer.

2 Methods

2.1 Sample

Included in the present analyses are all patients transferred from the Balfour Hospital to other centres of care during the twelve months from 1 July 2010 to 31 June 2011. This period was selected as a similar project was underway (led by Elizabeth Rayner, a medical student from St George's University of London) that examined transfers of patients under the care of the Balfour medical team. The data presented here include those patients included in the previous dataset, to which were added further groups of patients transferred during the same period. The additional patients were adults under the care of the surgical, obstetric and mental health teams, or were children (<16 years).

2.2 Data collection

Patients transferred from the Balfour Hospital were identified using the NHS Orkney electronic patient record system. Demographic data were available from that database, and further clinical data (including diagnosis, reason for transfer, and transfer destination) and were gathered from

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review of clinical notes and case review meeting notes. Data from different sources were linked for each individual using the Scottish nationwide patient identifier (known as the community health index, CHI). The data were anonymised following identification of patients, and all anonymised data were collated into a single dataset. Only data relating to time spent by patients at the Balfour Hospital were available, so no information about subsequent interventions and outcomes at receiving hospitals could be added.

2.3 Ethical approval

The project was discussed with the NHS Orkney Caldicott Guardian. It was agreed that since the data being used were anonymised and purely observational, specific ethical approval for the project did not need to be sought.

2.4 Statistical analysis

All analyses were conducted using Stata version 11.2 (Stata Corp., Texas, USA). The present study is observational and cross-sectional - descriptive statistics, cross-tabulations, and graphical representation of these, were used throughout. Since some patients were transferred from the Balfour Hospital on more than one occasion, the numbers of occurrences quoted below relate to the number of transfers, rather than the number of patients, unless otherwise specified.

3 Results

3.1 Patient demographic characteristics

During the 12-month study period, 317 transfers to other hospitals were made for 301 patients; 24 patients were transferred from the Balfour twice, and six patients on three occasions. The median age of patients at transfer was 61 years (range 0 to 94 years) (Table 1), and 51% of transferred patients (n=163) were female.

Age group (years)

<18-29 30-39 40-49 50-59 60-69 70-79 89-89 >89

3.2 Clinical characteristics

Table 1: Patient age

No. of transfers (%)

28 (8.8%) 30 (9.5%) 26 (8.2%) 32 (10.1%) 56 (17.7%) 54 (17.0%) 48 (15.1%) 7 (2.2%)

All major specialties within the Balfour Hospital transferred patients during the study period. The majority of patients were under the care of either the medical team (49%, n=155), or the surgical team (26%, n=83). Thirty-eight children (11% of total), 29 (9%) obstetric patients, and 14 (4%) mental health patients were transferred. Of the 317 patient transfers, 296 (93.4%) were made by paramedic-crewed air ambulances, and 21 (6.6%) by the emergency medical transfer service, a consultant-led team of critical care or anaesthetic doctors capable of transferring unstable and ventilated patients.

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3.3 Purpose of transfers

The most frequently occurring reason for transferring patients was for imaging (29%, n=96 - Table 2). Within this group, 92 transfers were made for computed tomography (CT) scanning, one for magnetic resonance imaging (MRI), and three for ultrasound scans. Interventional cardiology accounted for a substantial number of transfers (14%, n=47), as did orthopaedic (6%, n=20) and abdominal (8%, n=5) surgery. Twenty-seven transfers (8%) were made for obstetric care, which included induction of labour, emergency delivery, and neonatal care. The primary illnesses or disorders of transferred patients varied widely. The commonest complaint were the acute coronary syndrome (12.6%, n=40) and transient ischaemic attack (TIA) or stroke (9.2%, n=29). Other frequently occurring presentations were skeletal fractures (n=17, 5.4%), suspected pulmonary embolism (3.2%, n=10), respiratory tract infections (4.4%, n=14) and sepsis (2.5%, n=8). A broad range of medical, surgical, obstetric and psychiatric presentations accounted for the remainder of transfers, each in small number.

An important reason for transfer was to allow access to specialist medical and surgical management, in a wide range of specialties (28%, n=94). The Balfour Hospital provides a general acute medical and surgical service, so patients requiring more specialised investigation or management, or specialist decisions about interventions are often transferred. The proportions of medical and surgical patients transferred is shown separately for each specialty in Figure 3. There is a loose relationship between the numbers of admissions and transfers, most notably for medical patients, although the pattern is not consistently observed throughout the study period.

Purpose of transfer

Table 2: Purpose of transfers
No. of transfers (%)

CT/MRI/USS
Specialist management
Interventional cardiology
Obstetric care
Orthopaedic surgery Endoscopy/interventional gastroenterology Intensive care
Abdominal surgery
Other surgery
Data unavailable

3.4 Timing of transfers

93 (29%) 89 (28%) 46 (15%) 25 (8%) 19 (6%) 8 (3%)

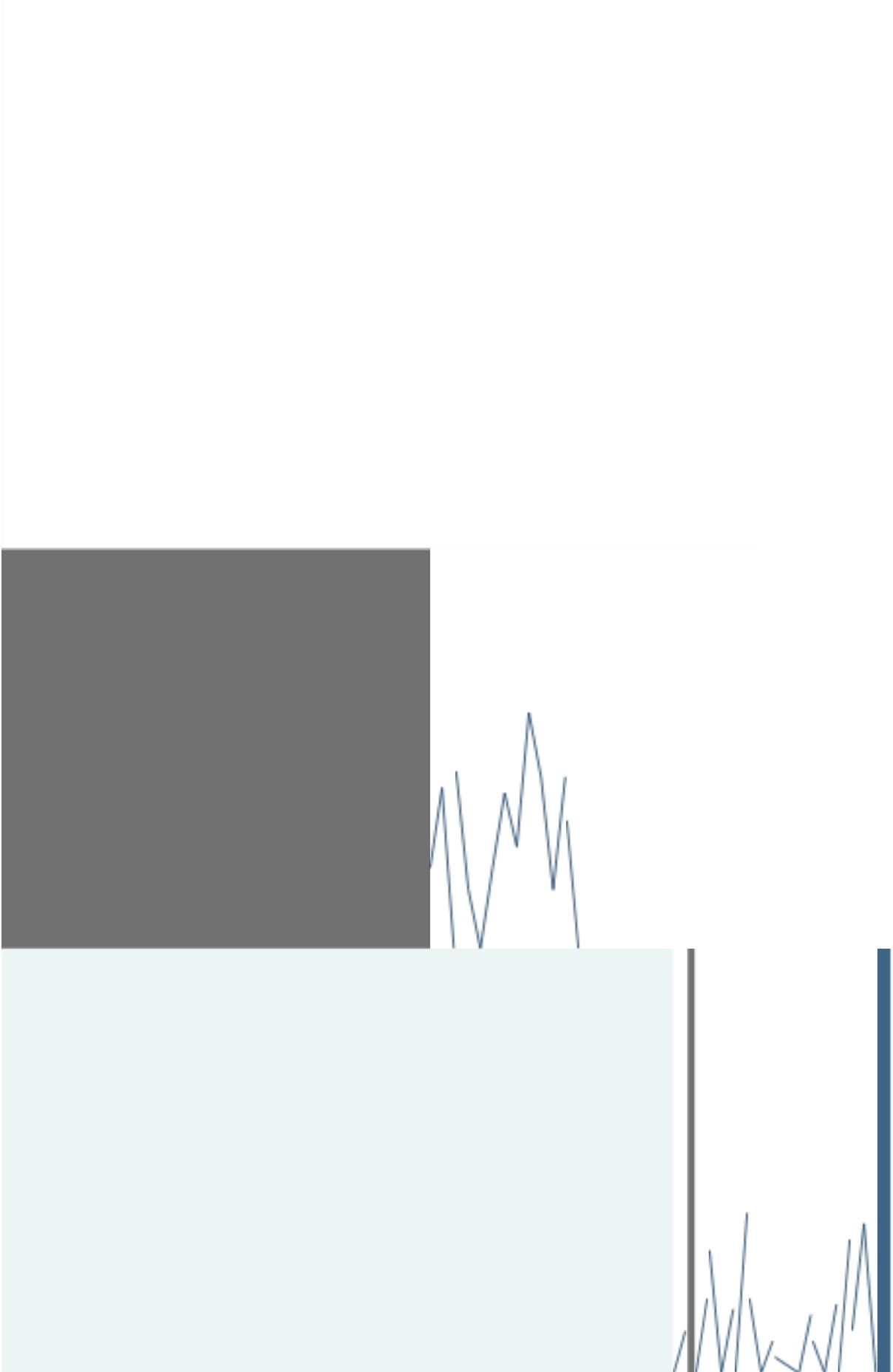
7 (2%) 5 (1%) 4 (1%) 21 (7%)

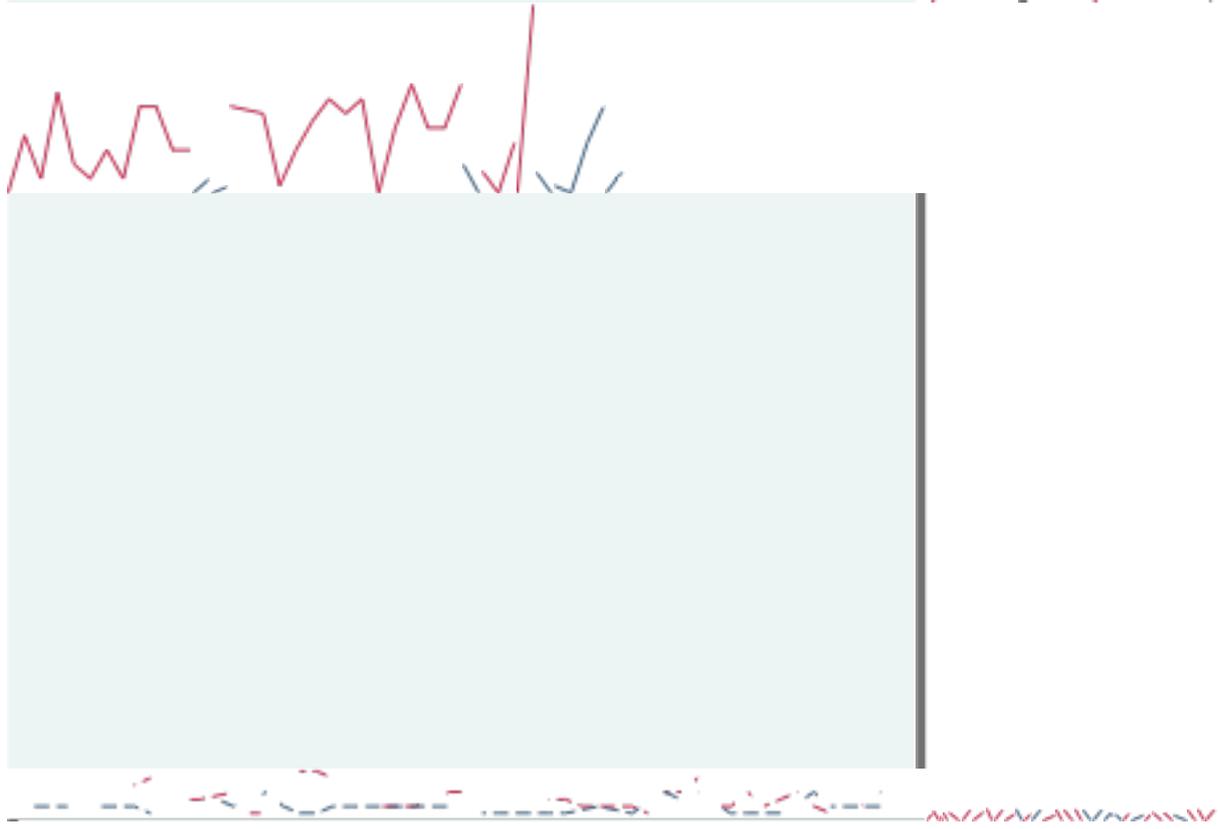
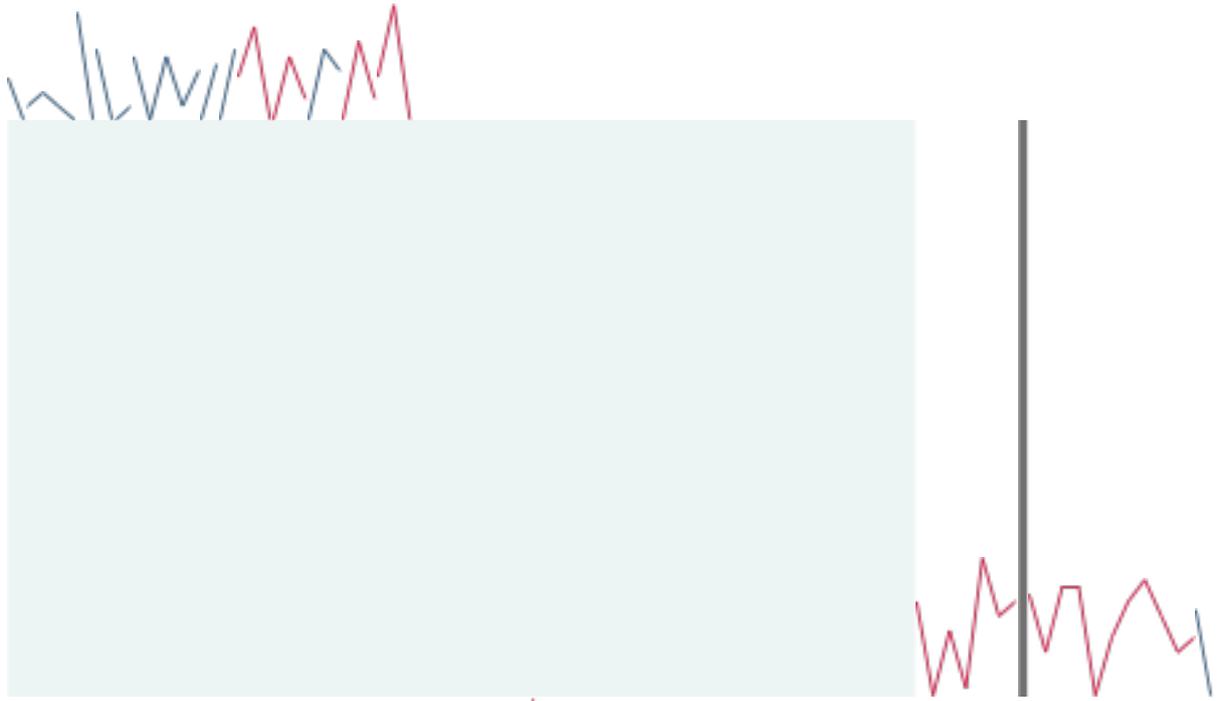
There was no clear pattern in the numbers of transfers from the Balfour according to the month during the study period from July 2010 to June 2011 (Figure 4). October 2010 saw the greatest number of transfer (n=33) and February 2011 the fewest (n=17), and weekly numbers of transfers were between zero and 13. When compared with the total numbers of patients admitted to the Balfour grouped by week during the study period, the proportion of patients transferred varied considerably (Figure 5). The median proportion of admitted patients who were transferred was 7%, and ranged from zero to 22%. There was some variation in the day of the week on which transfers took place. Mid-week transfers occurred most frequently (Wednesday n=59, 18.6%; Tuesday n=48, 15.1%), while transfers at the weekend were less common (Figure 6).

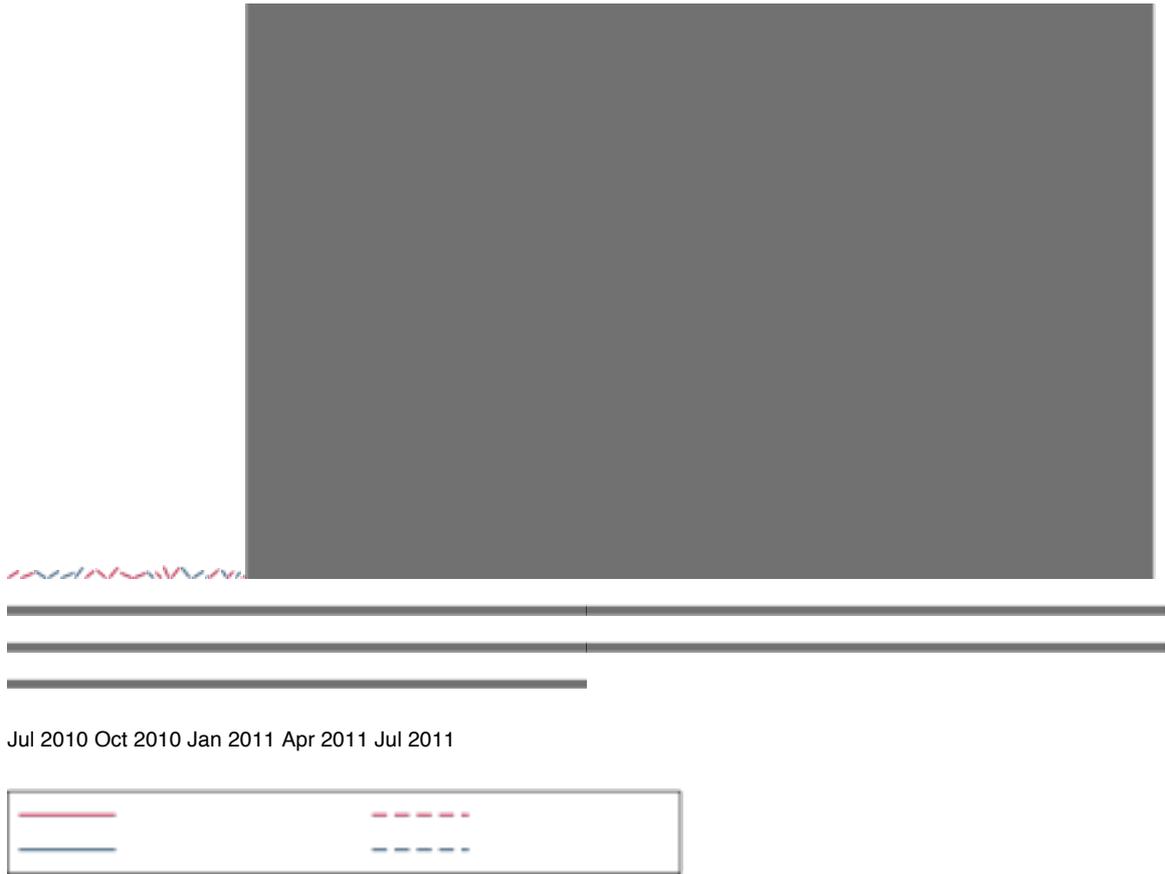
The majority of transfers occurred on the day of the patient's admission, or very shortly afterwards. The median length of stay at the Balfour prior to transfer was 1 day (interquartile range 2 days), and ranged from zero (i.e. on the day of admission) to 47 days.

3.5 Transfer destinations

The Balfour Hospital has a close relationship with the Aberdeen Royal Infirmary and Aberdeen Maternity Hospital. In partnership, the three hospitals provide almost all clinical services to the Orkney population. As might be expected, the vast majority of transfers were made to the Aberdeen Royal Infirmary, with large numbers of patients also being moved to the Aberdeen







Admissions – medical Transfers – medical Admissions – surgical Transfers – surgical

Figure 3: Transfers as proportions of total admissions per week to medical and surgical teams at the Balfour Hospital

Maternity Hospital and Royal Aberdeen Children’s Hospital (Table 3). Patients were transferred to a number of other specialist centres, particularly tertiary paediatric hospitals, and to the mental health services at the Royal Cornhill Hospital in Aberdeen.

Destination hospital

Table 3: Transfer destinations
No. of transfers (%)

- Aberdeen Royal Infirmary
- Aberdeen Maternity Hospital
- Royal Aberdeen Children’s Hospital
- Royal Cornhill Hospital (Aberdeen)
- Royal Hospital for Sick Children (Edin- burgh)
- Yorkhill NHS Trust (Glasgow)
- Raigmore Hospital (Inverness)
- Royal Infirmary of Edinburgh at Little France
- Ninewells Hospital (Dundee)
- Royal Alexandra Hospital (Paisley)
- Royal Hospital for Sick Children (Glasgow) Southern General Hospital (Glasgow) Woodend General Hospital (Aberdeen) Data unavailable

4 Discussion

236 (74.5%) 27 (8.5%) 22 (6.9%) 13 (4.1%)

4 (1.3%)

3 (1.0%) 2 (0.6%) 2 (0.6%)

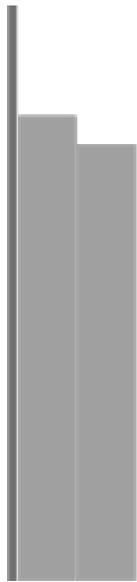
1 (0.3%) 1 (0.3%) 1 (0.3%) 1 (0.3%) 1 (0.3%) 3 (1.0%)

This retrospective study includes 317 patient transfers from the Balfour Hospital to centres in mainland Scotland. The patients were predominantly elderly, and the majority were admitted to the Balfour Hospital under either the medical or surgical teams. Transfers were made for a variety of reasons, though most frequently for imaging (CT or MRI scanning) or specialist medical or surgical care that could not be provided in Orkney. There was no clear pattern of differences numbers of transfers according to the time of year, or day of the week, and the proportion of total admissions that were transferred per week was up to 22.4%.

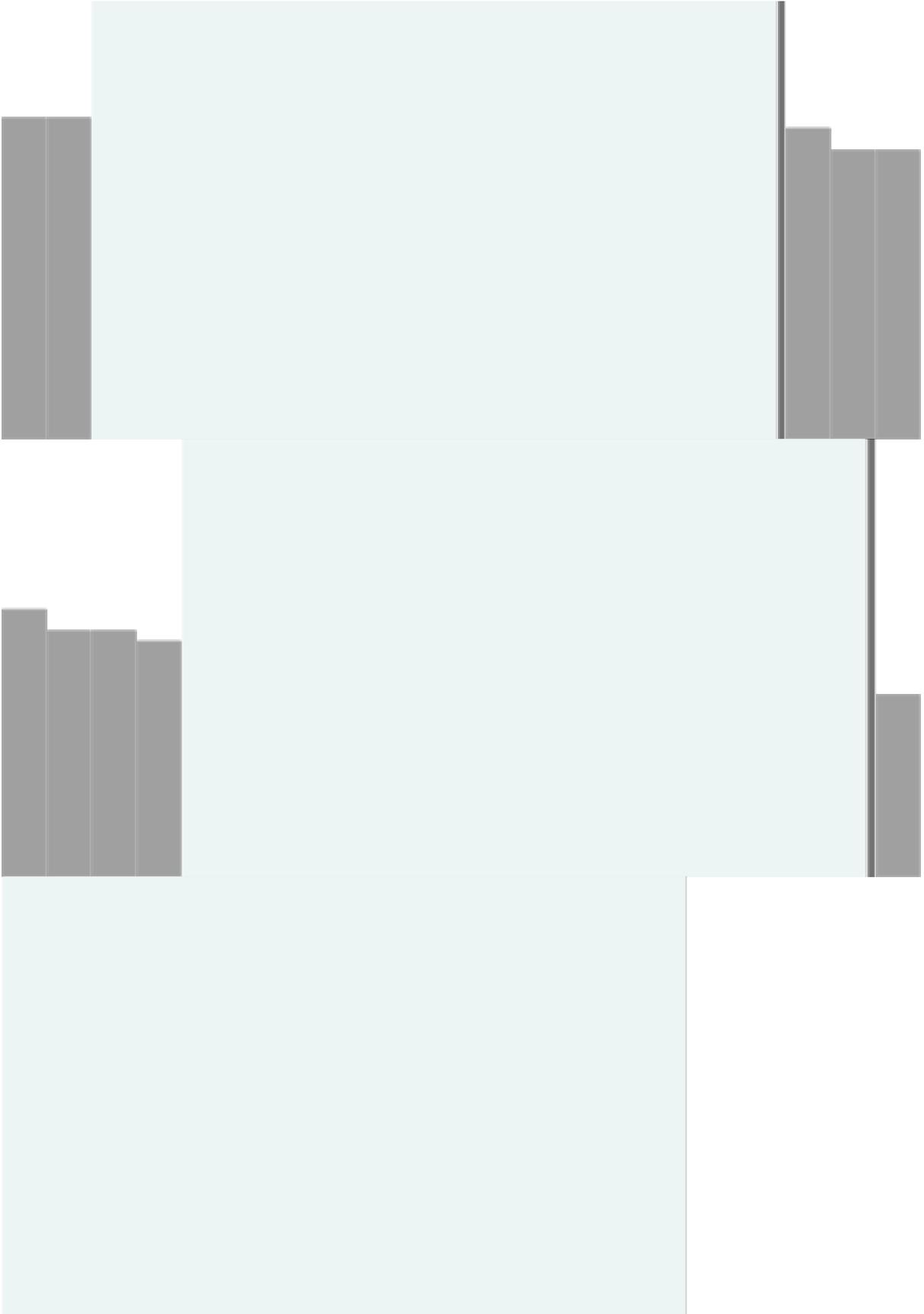
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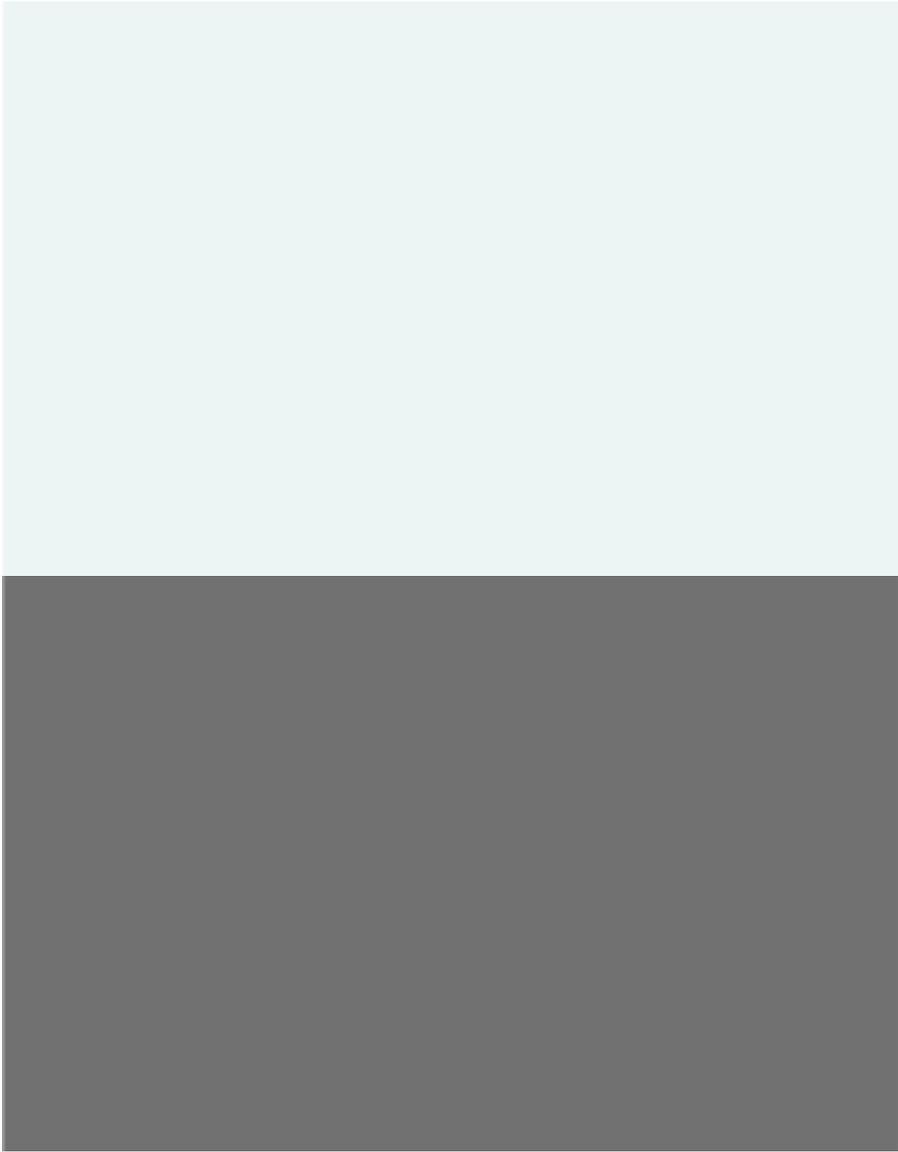
No. of patients/transfers
0 20 40 60





30
20
10
0





Month	Total Transfers
Jan	
Feb	
Mar	
Apr	
May	
Jun	
Jul	
Aug	
Sep	
Oct	
Nov	
Dec	

Figure 4: Total transfers from the Balfour Hospital by month

There is little published evidence on the clinical and demographic characteristics of patients transferred from remote hospitals, and about the operational role of aeromedical transfers in the broader delivery of remote and rural healthcare. The majority of the literature concerns services for specific conditions (e.g. trauma, acute coronary syndrome). Moreover, most reports are from rural Canada, the USA and Australia. The unique geography of Orkney, being a remote island community frequently beset by severe weather makes valid comparison with much published data difficult. In order to identify the most relevant evidence on this subject, Medline was searched via PubMed using the following search string: “patient transfer* AND (remote OR rural) AND hospital”.

4.1 Patients

As noted above, there is little evidence with which to compare the findings at the Balfour Hospital. In one report from a remote Canadian hospital serving a population of approximately 10,000 people, 1,055 patients were admitted over a period of 18 months (1991-2), of whom 10% (155) were transferred (De Freitas et al., 1998). The hospital in that study was larger than the Balfour Hospital with a greater capacity for critical care. A Scottish nationwide audit of inter-hospital patient transfers in 2006-7, incorporating both paramedic and specialist retrieval crews suggests that the data from Orkney in 2010-11 is does not differ dramatically from the rest of the country (Fried et al., 2010). The variability in the proportion of admissions transferred in the present study was substantial (range 0-22.4%). A number of reasons may underlie this variation. First, the casemix of admitted patients is not constant throughout the year, partly influenced by weather-related inter- island transport difficulties, and many weeks may see relatively few very unwell patients. Moreover, the summer tourist season brings several thousand additional people to Orkney, including the passengers of many large cruise ships who come ashore to visit the islands. The Balfour Hospital cares for the large numbers of these visitors who find themselves in need of medical care, and who may present with a different range of pathologies to the resident Orcadians. Second, the hospital is staffed by a rota of senior doctors (GPs and consultant surgeons and physicians) who work for one week at a time. Each doctor may have different patterns of decision-making for transferring patients, leading to differences in the numbers of transfers between rota weeks. Furthermore, in common with other Scottish RGH experience, the Balfour is staffed by a combination of permanent staff and locum tenens doctors (Sim, 2011), adding further variation in practice.

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No. of transfers

Jul 2010
Aug 2010

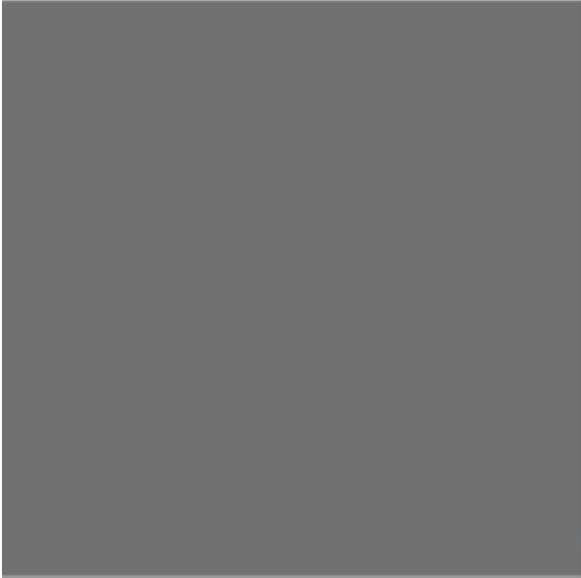
Sep 2010
Oct 2010

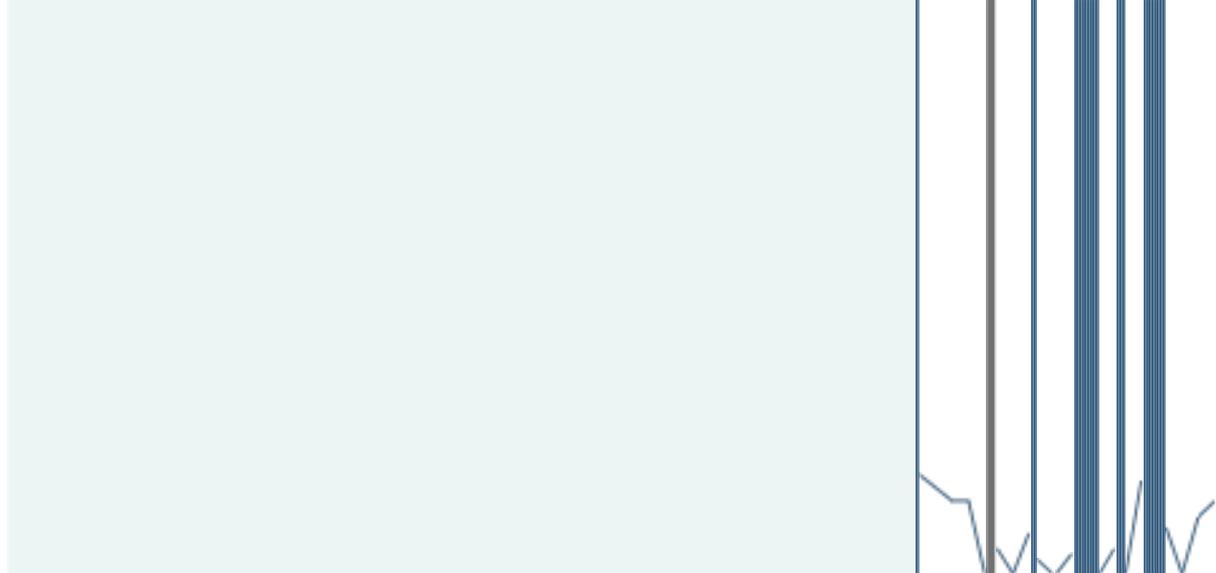
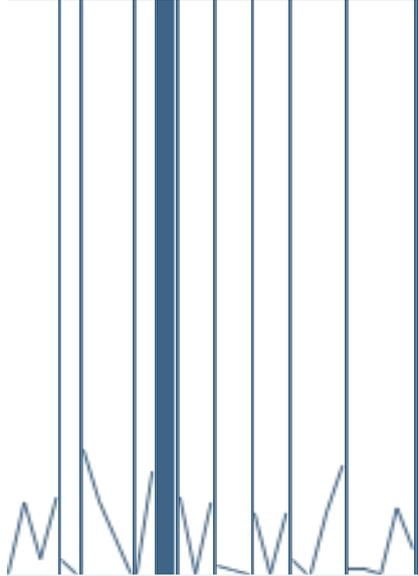
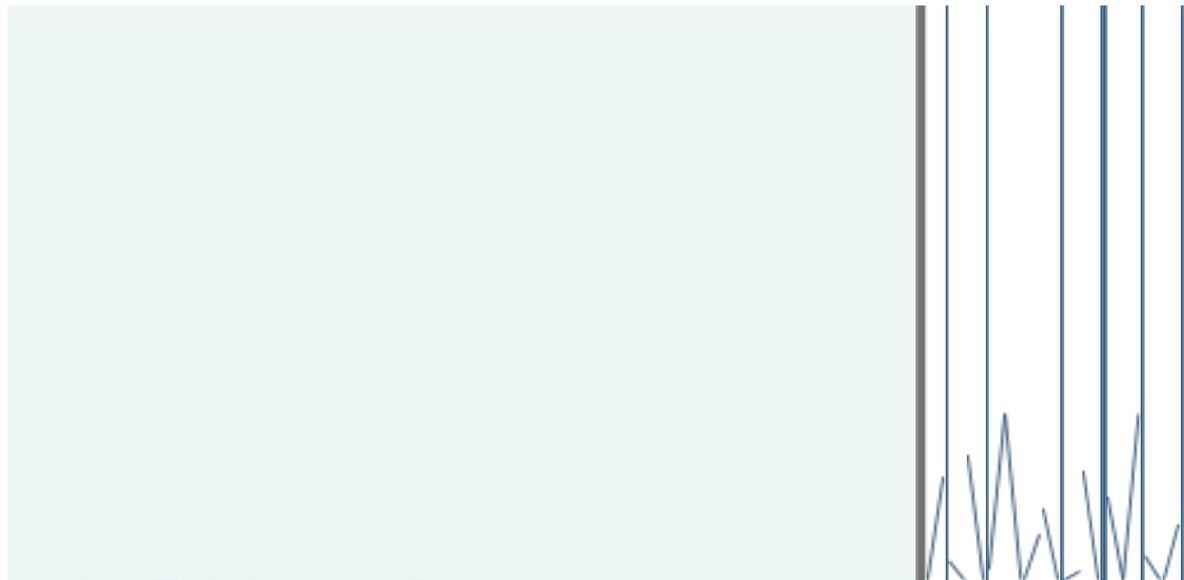
Nov 2010
Dec 2010

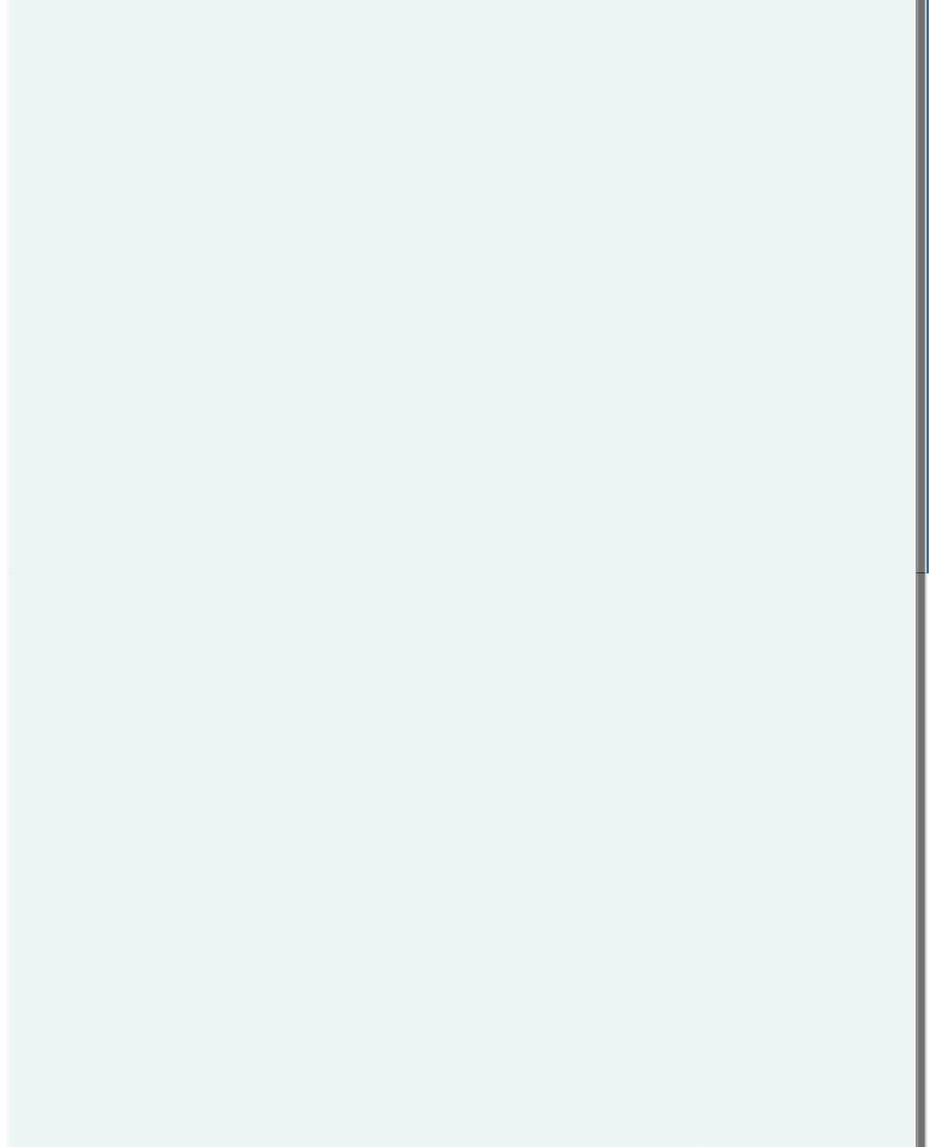
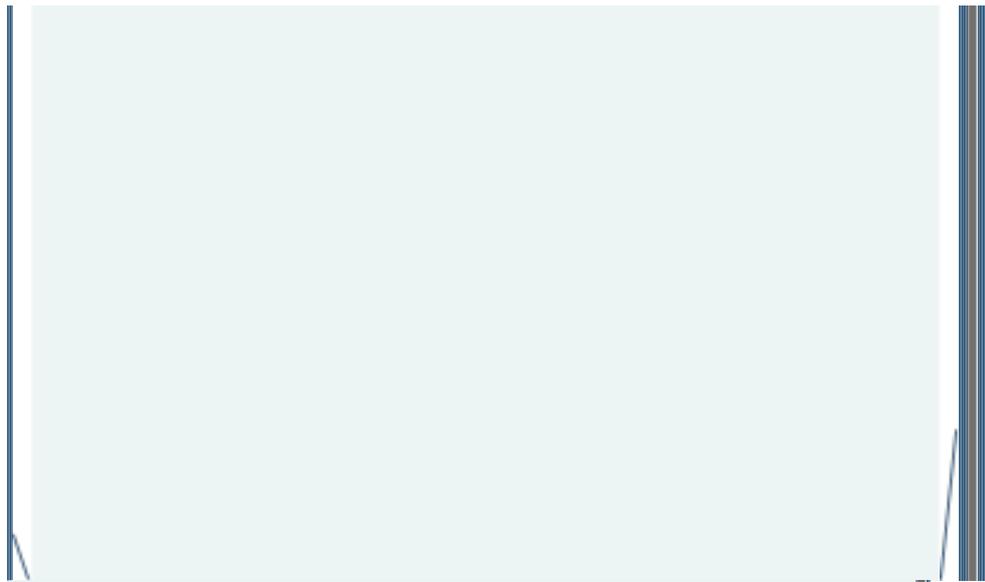
Jan 2011
Feb 2011

Mar 2011
Apr 2011

May 2011
Jun 2011







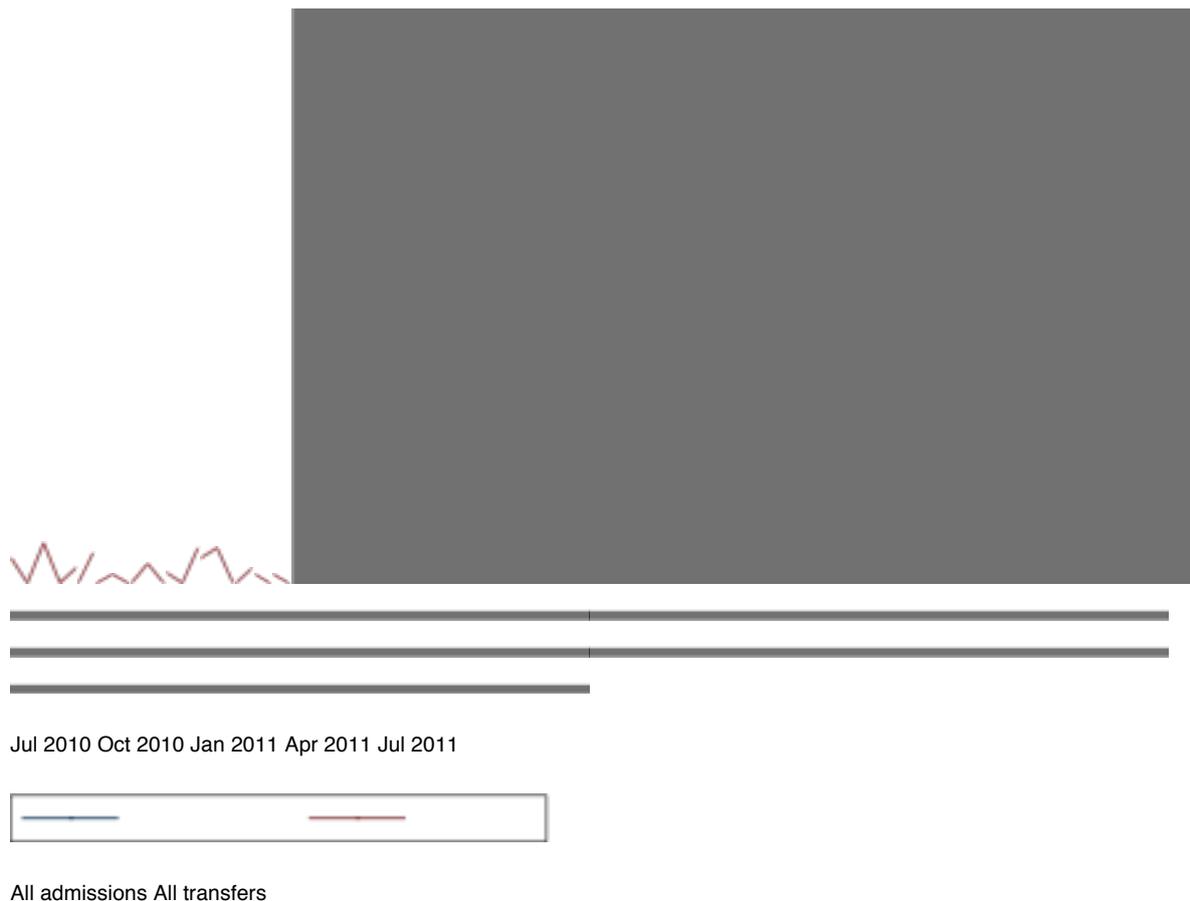


Figure 5: Total transfers and admissions at the Balfour Hospital by week
 The proportion of all admissions each week that were transferred out of the Balfour Hospital are shown adjacent to the line representing the total number of transfers.

The majority of transfers were made using the Scottish Ambulance Service (SAS) paramedic-crewed air ambulance. This service transports patients whose condition is stable and can be managed without the need for specialist medical staff. A small number of patients (n=21, 6.6%) were transferred by the Scottish emergency medical retrieval service (EMRS), an airborne critical care unit staffed by senior specialist medical staff. The EMRS operates a small number of fixed wing aircraft dedicated to retrieving very sick patients from remote areas in Scotland (NHS Scotland, 2010). Evidence from soon after the establishment of the EMRS in Scotland suggests that clinical benefit was gained in critically unwell patients from deployment of a specialist retrieval service (Corfield et al., 2006), a policy upheld by a recent report on remote and rural health in Scotland.

The Scottish Highlands and Islands have a well established and well equipped telemedicine network. Videoconferencing facilities are available in most clinical areas of the Balfour Hospital, including the emergency department resuscitation area, outpatient clinics and medical staff seminar and rest rooms. Telemedicine plays an important role in the decision-making process prior to patient transfer. Comprehensive discussions can be had with clinicians at the receiving hospital with live video feed of the patient and clinicians at the Balfour, facilitating decisions about whether to transfer a patient and by what means (i.e. air ambulance or EMRS). The role of telemedicine in remote and rural healthcare has become increasingly important with the greater availability of high bandwidth data connections in remote areas, and can often improve the efficiency and efficacy of care of very unwell patients in these areas (Kyle et al., 2012).

4.2 Purpose of transfers

The primary purpose of patient transfers in this study was for imaging (CT, MRI or USS - see Table 2), a situation also reported in a remote setting in Canada (Rourke and Kennard, 2001). The Balfour Hospital

currently has only plain x-ray and ultrasonographer-led USS services, but no CT or MRI scanner, or resident radiologist. It is notable that since this study was initiated, early data were used as evidence in making a business case for acquisition of a CT scanner in Orkney. The plan for installation of the scanner continues to be discussed but is expected to be completed in the coming months. It is anticipated that access to a CT scanner within the Balfour Hospital will reduce the number of transfers, and therefore also the associated cost and risk to patients.

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No. of patients/transfers
0 20 40 60 80 100

9.7 10.0

5.6
13.6

5.6 5.3

9.1 2.3

0.0
12.1

9.9 8.9

8.7 9.6

11.1 2.9

7.2 5.9

2.7 3.0 5.0

6.7 9.5

7.9 6.0

5.3 2.7

12.3 15.1 19.3

22.4 13.3

10.8 7.4

6.1 3.7

5.0

6.8 7.1

4.9 7.1 7.3

14.8 17.3

18.6 4.8

8.9 7.9 7.3 6.5

11.8 1.4

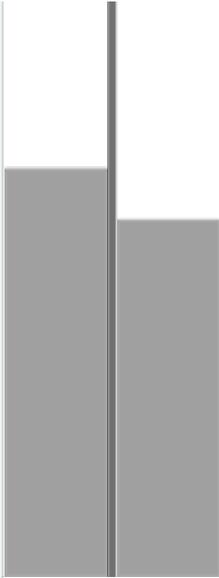
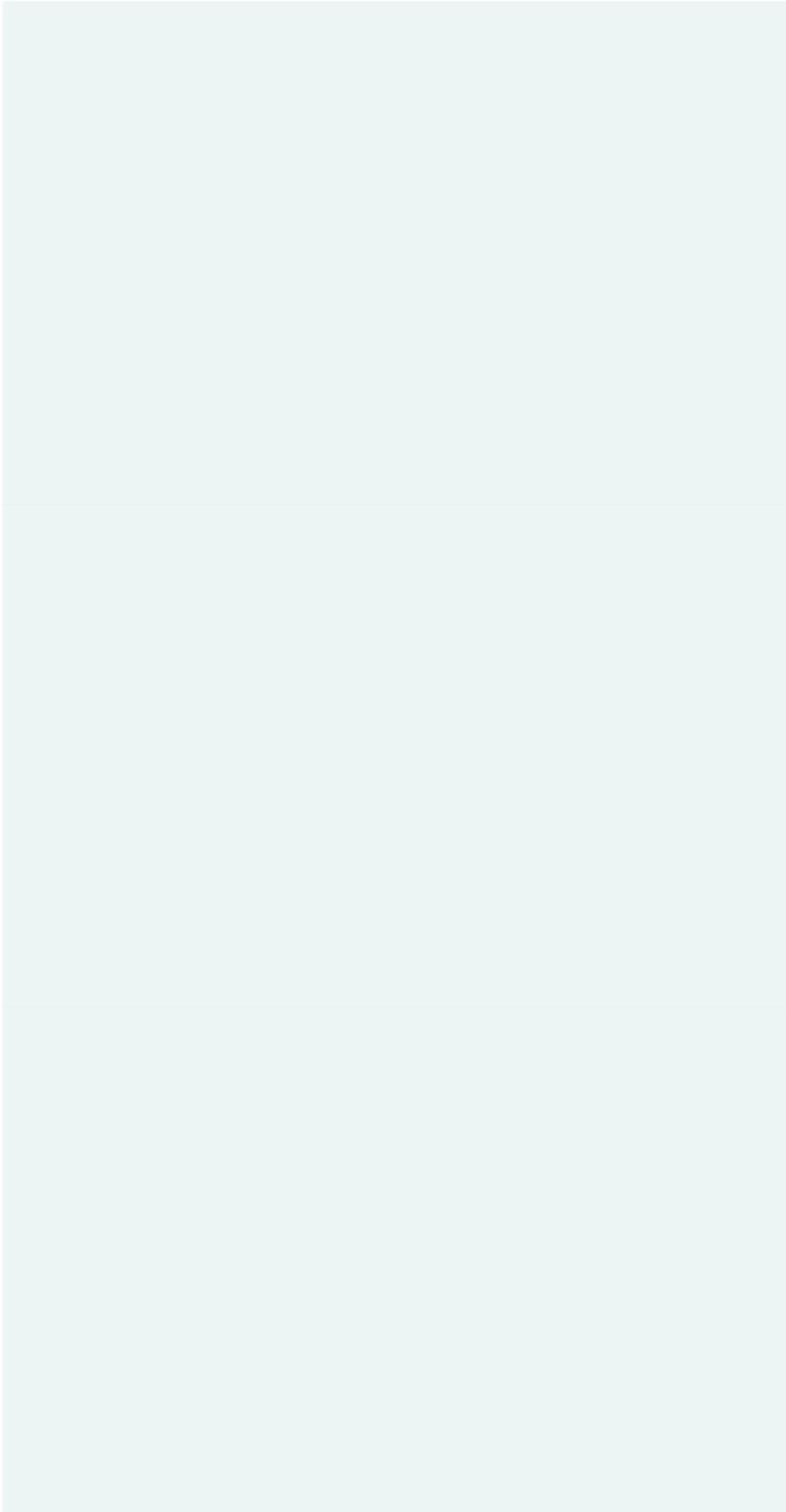




40

20

0





Sunday Monday Tuesday Wednesday Thursday Friday Saturday

Figure 6: Total transfers and admissions at the Balfour Hospital by day of the week

Another important group of transfers were those for interventional cardiology following acute myocardial infarction (MI). Again, the Balfour does not have facilities for cardiac catheterisation so all patients in need of such procedures must be transferred. The value of transferring patients from remote areas to a centre providing percutaneous coronary intervention (PCI) following acute MI is, however, uncertain. Studies from other remote centres suggest that transferring patients to a PCI centre within the recommended time window for PCI efficacy is achievable (Blankenship et al., 2011). The unusual topography of Orkney, with several widely-dispersed islands and relatively scanty facilities for safe and rapid patient transport to either the Orkney or Scottish mainlands makes this difficult, and frequently impossible. Indeed, there is evidence to support treatment of remote ST-elevation MI patients with thrombolysis at local hospitals before transfer to a tertiary centre for adjunctive or rescue PCI procedures (Bøhmer et al., 2010; Larson et al., 2012).

5 Implications for service

The data presented here give a broad illustration of the types of patients transferred from the Balfour Hospital, the reasons for those transfers, and their operational circumstances. Two aspects of the findings are important for service provision at the Balfour. First, the absolute number of patient transfers is high. 317 transfers in a year-long period approximates to a little under one transfer per day. The work involved in arranging a transfer and preparing the patient, in addition to the ongoing challenging care of very unwell patients adds substantially to the daily workload of medical, nursing and clerical staff at the Balfour. The second feature is the wide variability in the numbers of patients being transferred. There appears to be little pattern in the proportion of admissions that are transferred, and so both hospital staff and the aeromedical teams must be prepared for uncertain demands. Resources are, however, at hand for improving the way the healthcare service responds to the need for patient transfers. As mentioned above, the telemedicine network and partnerships between the remote Balfour Hospital and mainland tertiary hospitals allow in-depth discussions between referring and receiving clinical teams about the condition of the patient, their immediate and longer term management needs and the most appropriate means of transport if transfer becomes necessary. On a broader level, clear plans for which patients are most likely to need to be transferred, the likely destination clinical team and the transport requirements may help to

streamline the transfer process, and ensure the patient reaches the most appropriate clinical setting as fast as possible.

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No. of transfers

6 Limitations

While the present dataset is relatively large and includes a range of relevant information, the study nonetheless has limitations. First, the data are retrospective so only the variables collected as part of routine recordkeeping are available. A prospective design would allow planning of the best data to collect, resulting in a more informative dataset. The data are almost three years old (2010- 11), opening the possibility that they are not entirely reflective of current practice. The service model at the Balfour has, however, changed little since the data were collected, so this problem is minimised. The most important question in a study of this type is the magnitude of any impact of measured factors on patient outcomes. Outcome data are not available in the current dataset, but information about post-transfer length of hospital stay, survival, clinical improvement and deterioration, and success of interventions would be valuable. Furthermore, from a service audit perspective, data on the costs of transfers and the subsequent care at receiving hospitals would be important. Detailed data are currently awaited for the mental health patients in the dataset, and these will need to be added to the study later. The study in its present form does not undertake any hypothesis testing, which would be an instructive addition at a later stage.

7 Summary

This is a retrospective observational of 317 patient transfers from the Balfour Hospital, Orkney to other hospitals on the Scottish mainland. The data demonstrate the demographic characteristics of the transferred patients, the reasons for their transfers and the clinical specialties at the Balfour from which they were referred. The day of the week and month on which transfers took place are presented, along with the length of time patients were admitted to the Balfour before being transferred. The key findings of the study are the relatively small number of principal purposes for transfer (i.e. imaging, specialist management, surgery), the wide variability in numbers of transfers throughout the year, and the trend towards very short inpatient stays at the Balfour before transferring. As noted above, the present study could be augmented by a number of additional analyses.

Word count: 2983

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