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Date 12 March 2014
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TO: All Members of Health Scrutiny Committee

Councillors : A Audin, D Bailey, P Bury (Chair), L Fitzwalter, S Haroon, T Holt, K Hussain, D O'Hanlon, N Parnell, A Simpson, S Smith and R Walker

Dear Member/Colleague

Health Scrutiny Committee

You are invited to attend a meeting of the Health Scrutiny Committee which will be held as follows:-

Date:	Thursday, 20 March 2014
Place:	Peel Room, Elizabethan Suite, Town Hall, Bury
Time:	7.00 pm
Briefing Facilities:	If Opposition Members and Co-opted Members require briefing on any particular item on the Agenda, the appropriate Director/Senior Officer originating the related report should be contacted.
Notes:	

AGENDA

The Agenda for the meeting is attached.

Reports are enclosed only for those attending the meeting and for those without access to the Council's Intranet or Website.



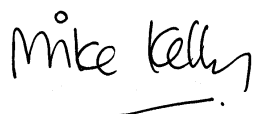
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Copies of printed reports can also be obtained on request by contacting the Democratic Services Officer named above.

Yours sincerely

A handwritten signature in black ink that reads "Mike Kelly". The signature is written in a cursive style with a horizontal line underneath the name.

Chief Executive

AGENDA

1 APOLOGIES FOR ABSENCE

2 DECLARATIONS OF INTEREST

Members of Health Scrutiny Committee are asked to consider whether they have an interest in any of the matters on the agenda and if so, to formally declare that interest.

3 PUBLIC QUESTION TIME

Questions are invited from members of the public present at the meeting on any matters for which this Committee is responsible.

4 MINUTES OF THE LAST MEETING (Pages 1 - 8)

The Minutes of the Meeting held on 28 January 2014 are attached.

5 MATTERS ARISING

6 GP FEDERATION - INTRODUCTION

Michelle Armstrong, GP Federation Chief Officer will attend the Meeting.

7 BURY CLINICAL COMMISSIONING GROUP STRATEGIC PLAN 2014 - 2019

Sharon Martin, Head of Commissioning at Bury CCG will give a presentation at the meeting.

8 COMMUNITY SERVICES

Sharon Martin, Head of Commissioning at Bury CCG and Howard Hughes, CCG Clinical Cabinet Chair will give a presentation at the meeting.

9 UPDATE ON STROKE SERVICES (Pages 9 - 18)

A letter explaining the further centralisation of stroke services in Greater Manchester is attached.

Appendix attached.

10 URGENT BUSINESS

Any other business which by reason of special circumstances the Chair agrees may be considered as a matter of urgency.

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Minutes of: **HEALTH SCRUTINY COMMITTEE**

Date of Meeting: 28 January 2014

Present: Councillor P Bury (in the Chair)
Councillors A Audin, S Haroon, T Holt, K Hussain,
D O'Hanlon, N Parnell, A Simpson, S Smith and R Walker

Also in attendance: Julie Gonda – Assistant Director – Adult Care Services
Linda Jackson - Assistant Director – Adult Care Services
Lesley Jones – Interim Director of Public Health
Stuart North – Bury CCG
Dr Kiran Patel- Bury CCG
Andrew Ramwell – Chair - Healthwatch Bury

Public Attendance: There was one member of the public present at the meeting.

Apologies for Absence: Councillor D Bailey and Councillor L Fitzwalter
Councillor R Shori – Cabinet Member - Adult Care,
Health and Housing

HSC.702 DECLARATIONS OF INTEREST

Councillor Parnell declared a personal interest in any item relating to NHS as his wife was employed by the NHS.

Councillor Simpson declared a personal interest in any item relating to the NHS as she was employed by a medical practice in Salford.

HSC.703 MINUTES OF THE LAST MEETING

It was agreed:

That the Minutes of the Last Meeting held on 10 December 2013 be approved as a correct record and signed by the Chair.

HSC.704 MATTERS ARISING

1. Councillor Walker referred to Minute HSC.601 – Matters Arising and referred to the question he had raised regarding the Drug and Alcohol Team and the fact that this service would be provided by a new provider and asked whether the Committee could look at this issue.

Councillor Bury explained that he had met with The Executive Director of Adult Care Services and had discussed this issue. It had been agreed that it would be discussed at a future meeting of the committee and then the service reviewed after an adequate amount of time operating.

2. Councillor Smith referred to Minute HSC.601 – Matters Arising and the question raised in relation to the paediatric unit at Fairfield General Hospital

and asked whether the unit had now closed.

Stuart North explained that the unit had been temporarily closed on and off and no decision to close it permanently had been made as yet. If the unit was to be closed permanently, this would be reported to the Scrutiny Committee for their input.

3. Councillor O'Hanlon referred to Minute HSC.601 - Matters arising where he had asked about a meeting that had been attended by the Leader rather than the Cabinet Member and stated that he felt that the Cabinet Member should attend such meetings as he was the Councillor who would be expected to answer questions concerning the services discussed.

HSC.705 HEALTHIER TOGETHER UPDATE

Stuart North, Chief Executive at Bury CCG and Dr Kiran Patel Chair of the CCG gave an update on the progress of the Healthier Together reconfiguration that was currently being developed across Greater Manchester.

The Healthier Together consultation had been due to commence across Greater Manchester in January 2014. Following a review of the work required it had been decided that the consultation would start later in the year to allow for the model options to be developed fully whilst working with all partners involved including patients and professionals. It was anticipated that the consultation would start toward summer 2014 but conversations were already underway regarding the options.

It was widely recognised that there was a need to the way that health and social care services were provided with people living longer and many with multiple long term conditions, expectations growing and services being fragmented. It was anticipated that there would be both local services and specialist services with patients at the centre. Expertise would be pooled to develop centres of excellence which would improve outcomes and patient experience.

The Healthier Together reconfiguration plan would also need to consider wider services such as Primary Care, Community Services and Integrated Care to ensure that all changes to service provision complemented any other changes happening across the whole health and social care landscape.

It was reported that views were being gathered and communities updated on the issues of joining up health and social care services, enhancing GP and community services and transforming hospital services. The

There would be a number of events held across the borough to enable engagement with as many people as possible including attendance at each Township Forum meeting.

Members were given the opportunity to ask questions and make comments and the following points were raised:-

- Councillor Bury referred to the fact that Healthier Together was just one

part of service redesign and that a lot was also being done at a local level and asked how the two would work together.

Stuart North agreed that the situation was challenging and explained that due to the current financial situation some providers were having to make changes to the way that they worked. The CCG was asking them to go along the same direction of travel as Healthier Together. The challenges were the same for everybody and all were working towards the same end goal with the patient central.

- Councillor Simpson referred to the 5 year plan and explained that it was difficult to envisage this due to the lack of finances.

Stuart explained that it was challenging. NHS England had published information in relation to funding that CCGs should receive and this had shown that Bury was the lowest/worst funded CCG in the north West region. Work was being carried to try and rectify this situation with NHS England being lobbied and the situation being highlighted as much as possible.

- Councillor Walker explained that he had recently attended a Joint Health Scrutiny Meeting where it had been reported that pre operation assessments and gynaecological services would be moved to Royal Oldham Hospital and asked what had happened to the 2 corridors of care model that had been discussed some time ago.

Stuart reported that no decision had been made about the two services mentioned being provided at Royal Oldham Hospital, this was just a proposal at the moment. The decision on this would be reviewed in February. Stuart stated that he would take any concerns raised in relation to this issue back to John Saxby, Chief Executive at Pennine Acute NHS Trust.

- Councillor Parnell referred to the funding gap and the formula used and asked how funding was calculated.

Stuart explained that funding was worked out based on the population mix but there are a number of different formulae available and depending on which is used can make a difference.

- Councillor O'Hanlon asked once the changes are in place and specialist areas are based in one or two locations across the region, how many people from Bury will have a condition that won't be served by their local hospital.

Dr Patel explained that there are currently 10 acute surgical services across Greater Manchester, this would be reduced to 4 or 5. Acute medicine would still be available at all sites and it was anticipated that stroke services would be served at 3 and cardio at 1. It would not be possible to determine at this point how many Bury residents would be affected as there were no clear options set out as yet.

- Councillor Bury stated that it was difficult when discussing changes in service provision as it was automatically assumed that it would lead to hospital closures.
- Councillor Walker referred to patients being discharged more quickly from

hospital than they would previously have been and would therefore be relying on rehabilitation and support services provided by the council. Councillor Walker asked how this would be co-ordinated if a patient was at a hospital in another town.

Linda Jackson reported that a group from all of Adult Care Services across Greater Manchester was in the process of looking at a solution to this issue and a report with their findings and recommendations was due to be presented to the Greater Manchester CCG in February 2014.

Dr Patel also explained that this type of discharge was already undertaken where services had already been centralised.

- Councillor O'Hanlon asked what would happen if the model didn't deliver the desired outcomes and whether there were any other plans to fall back on if this was the case.

It was explained that as services were being developed there would be the opportunity to change anything that wasn't working as well as expected. The clinical outcomes would show lives saved and there would also be other factors such as length of stay in hospital and patient satisfaction.

- Councillor Bury asked when there would be feedback available from the Radcliffe Demonstrator.

Stuart reported that some early statistics would be available from April or May 2014.

It was agreed

That Dr Patel and Stuart be thanked for their presentation.

HSC.706 INTEGRATED HEALTH AND SOCIAL CARE PARTNERSHIP/BETTER CARE FUND PLAN

Julie Gonda - Assistant Director, Adult Care Services, Linda Jackson - Assistant Director, Adult Care Services and Lesley Jones, Interim Director of Public Health gave a joint presentation on the work that was being carried out in relation to the Integrated Health and Social Care Partnership and also in relation to the Better Care Fund Plan.

It was explained that the integrated care model will include all partners across health and social care working together and with people to support them to maintain their own health and manage their own care as much as possible. A partnership approach with an emphasis on prevention and early intervention which will be primary care centred with access to services 7 days a week co-ordinated and provided by integrated/multi disciplinary neighbourhood teams. It will focus on people at higher risk such as people with long term conditions and frail older people as well as having an emphasis on prevention to stop or slow down the long term conditions.

The partners and stakeholder identified include Bury CCG (GP practices and pharmacies), Bury Council (Adult Care, Public Health, Education Services and providers, Housing services and providers) Pennine Care NHS Foundation, Pennine Acute NHS Trust, mental health services, GP Federation, North West Ambulance Service, Care Homes, Home Care providers and the Department of Health plus others.

It was explained that the strategy was a 5 year strategy and would identify key deliverables across a continuum of need. 3 key deliverables had been identified:- Staying well, Re-ablement and intermediate care and integrated community based care.

The project would be able to take lessons from the Radcliffe Demonstrator and produce a joint outcomes framework.

The Governance Structure was explained and it was reported that the Integrated Health and Social Care Partnership Board was chaired jointly by The Director of Adult Care Services and The Chief Executive of the Clinical Commissioning Group and was accountable to the Bury Public Service Reform Board which in turn reported to the Greater Manchester Public Service Reform Leadership Team.

The work of the partnership Board had been to identify the key deliverables and the key enablers and task groups to carry out specific work in the requirements around these areas with a lead officer for each group.

Achievements around partnership provision were already being identified from work already being undertaken - operating 7 day opening GP practice in Radcliffe, a pilot integrated care team in Radcliffe would be rolled out wider within the next two months, the crisis response service for adults had been implemented, the integrated health and social care discharge team were in place and complex care arrangements were being co-ordinated.

Julie Gonda reported that the Draft Better Care Fund was due to be submitted to the Health and Wellbeing Board at its meeting on the 30 January 2014. The Fund required a 15% reduction in emergency activity by 2015/2016. The Fund would be made up of an NHS resource transfer of £11.7m of which £8m was from the CCG and the remaining £3.7m from other NHS resources. £3m of this will be directly related to performance and is dependent on joint working. The budget will be pooled and managed jointly between the CCG and local authority.

The Main aims of the better Care Fund were explained as:-

- to protect adult social care services; and
- to invest in new and re-shaped services which help integration and benefit both health and social care.

The Better Care Fund Plan is being produced jointly by Bury CCG and Adult Care Services with the final plan being submitted on 4 April 2014.

Members of the Committee were given the opportunity to ask questions and make comments and the following points were raised:-

Health Scrutiny Committee, 28 January 2014

- Councillor Simpson referred to the partnership and asked where education would fit in.

Lesley explained that she was leading on a piece of work focused on community engagement for health which would include promoting self care and suggested that the Committee receive an update on this work.

- Councillor Simpson referred to the Radcliffe Demonstrator and how when capacity is created the demand would meet it and asked what would happen if this stopped.

It was explained that services wouldn't be stopped they would look at how they could be changed to meet the desired requirements.

- Councillor O'Hanlon referred to the housing needs that were mentioned within the presentation and stated that Bury didn't have enough smaller properties currently.
- Councillor O'Hanlon also stated that transport issues should be considered as the roads become very busy and trying to visit patients within their homes could be problematic because of this.

Linda explained that all partners would be co-ordinating the way that they work and make changes where required. It was explained that somebody may currently receive 3 home visits from 3 different professionals in one day by working together in an integrated way one worker could provide a range of support for people reducing duplication, also we are looking to work in localities which will reduce the need for travel.

- Councillor Smith referred to the required 15% reduction in emergency activity and asked whether this was against existing or future need.

Stuart North explained that this was against existing activity.

- Councillor Smith also referred to the implementation of the different services and the possibility that some people may 'fall through the cracks' during that time.

Linda explained that all of the strategic issues were being reviewed to ensure that this doesn't happen. It was also important to look at other areas of risk such as how services will be funded from other providers such as Pennine Acute.

Dr Patel reported that risk profiling in GP practices had been reviewed with a plan to move from a reactive to a proactive way of working.

It was also explained that Social Care providers will be able to use NHS numbers to assist with sharing information as is currently being done in the Radcliffe Demonstrator. There was also work relating to data sharing being carried out at a national level.

- Councillor Parnell asked whether the reduction in emergency activity can realistically be reduced.

Dr Patel explained that 30 - 40% of people who currently attend A & E don't need to and some admissions could be treated at home. If services were available closer to home and more accessible this would lessen the need to attend A & E.

Julie Gonda explained that not all of what is to be implemented will be new, it will just be done differently.

- Councillor Walker referred to communication and the way that this would be carried out and asked that this be an area that is looked into as it has to be done right to ensure that as many people are aware of what is happening as possible.
- Andrew Ramwell, Chair of Healthwatch Bury asked what work was being carried with regards to social outcomes and organisational health issues.

Lesley reported that work around these areas would be undertaken as part of a wider plan.

- Mrs Brenda Headley stated that she felt that the presentations given had been very informative and interesting and that the new ways of joint working being planned would lead to exciting times ahead within health and social care.

It was agreed

1. That the contents of the presentation be noted.
2. That comments would be accepted up until 5 February 2014.
2. That Julie, Linda and Lesley be thanked for attending the meeting.

COUNCILLOR P BURY
Chair

(Note: The meeting started at 7.00 pm and ended at 8.50 pm)

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Greater Manchester Association of
Clinical Commissioning Groups

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3rd March 2014

To: Greater Manchester Health Scrutiny Committees

Re: Further Centralisation of Stroke Services in Greater Manchester

Dear Sir / Madam,

I am writing on behalf of the Greater Manchester Association of Clinical Commissioning Groups to share an update on the plans to improve acute stroke services in Greater Manchester. We want stroke patients to get the care they need and we are currently implementing plans to improve equity of access to the specialist services put in place 4 years ago.

In 2010 the Stroke Network supported a new service design so that people who ring 999 within 4 hours of their symptoms starting are taken by ambulance to one of three hospitals specially equipped to deal with emergency stroke patients. These specialist hospitals are Fairfield Hospital in Bury, Salford Royal Foundation Trust and Stepping Hill Hospital in Stockport. Once the emergency care is completed, patients are taken to their local district hospital for ongoing care and rehabilitation. If the ambulance is called more than 4 hours after stroke symptoms start, patients are taken directly to their local district hospital without having to go to a specialist hospital first.

We plan to develop this, in line with the original ambitions, so that all patients are taken to one of the three specialist centres, regardless of when or where their stroke takes place. Under the new services, all three centres will be open 7 days a week, and Salford will continue to be open 24 hours a day, 7 days a week. All stroke patients will stay in one of the three specialist centres for approximately the first 3 days of their care, whilst they receive the best practice care processes which are recommended in national guidance.

These changes have come about following an extensive process of review of the current model and appraisal of options to improve it. In January 2012 and most recently in November 2013 we presented to the Greater Manchester Health Scrutiny Committee, who enthusiastically endorsed the plans. A recent study (enclosed) covering over 45,000 stroke patients in England, provides further support. Researchers found that stroke patients presenting out of hours are still less likely to receive timely access to best practice care processes, such as brain scanning and rapid admission to stroke units, than patients presenting during normal hours, despite improvements over recent years. There was also evidence that, whilst short term (within 72 hours) mortality was not significantly affected, stroke patients who present to hospital at weekends have a higher risk of mortality within 30 days of being admitted.

Commenting on the recent study, "*The Effect of Out of Hours Presentation with Acute Stroke on Processes of Care and Outcomes: Analysis of data from the Stroke Improvement National Audit Programme (SINAP)*," published in the PLOS ONE journal, Professor Tony Rudd, National Clinical Director for stroke, said: "*The study shows that there are significant differences both in the patient population admitted with stroke out of hours, and in the quality of the care that they receive.*"

By centralising specialist stroke services into hyperacute centres, and giving all stroke patients access to these centres, we aim to embed services that deliver high quality care to all patients, regardless of when they present.

Please do not hesitate to get in touch if you would like any further information.

Yours faithfully,



Alan Campbell
Senior Responsible Officer for GM Stroke Centralisation
Accountable Officer NHS Salford CCG



Khalil Kawafi
Clinical Lead for GM Stroke Centralisation
Consultant Stroke Physician and Clinical Lead at Pennine Acute NHS Trust

The Effect of Out of Hours Presentation with Acute Stroke on Processes of Care and Outcomes: Analysis of Data from the Stroke Improvement National Audit Programme (SINAP)

James T. P. Campbell^{1*}, Benjamin D. Bray², Alex M. Hoffman¹, Sara J. Kavanagh¹, Anthony G. Rudd^{2,3}, Pippa J. Tyrrell⁴, on behalf of the Intercollegiate Stroke Working Party

1 Royal College of Physicians, London, United Kingdom, **2** King's College London, Division of Health and Social Care Research, London, United Kingdom, **3** National Institute for Health Research Comprehensive Biomedical Research Centre, Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom, **4** University of Manchester MAHSC, Salford Royal NHS Foundation Trust, Salford, United Kingdom

Abstract

Background: There is inconsistent evidence that patients with stroke admitted to hospital out of regular working hours (such as weekends) experience worse outcomes. We aimed to identify if inequalities in the quality of care and mortality exist in contemporary stroke care in England.

Methods: SINAP is a prospective database of acute stroke patients, documenting details of processes of care over the first 72 hours. We compared quality of care indicators and mortality at 72 hours, 7 days and 30 days, for patients who arrived within normal hours (Monday–Friday 8am to 6pm) and for those who arrived out of hours, using multivariable logistic and Cox proportional hazard models. Quality of care was defined according to time from arrival at hospital to interventions (e.g., brain scan), and whether the patient received therapeutic interventions (such as thrombolysis).

Results: 45,726 stroke patients were admitted to 130 hospitals in England between 1 April 2010 and 31 January 2012. Patients admitted out of hours (n = 23,779) had more features indicative of worse prognosis (haemorrhagic stroke, reduced consciousness, pre stroke dependency). Out of hours admission was significantly associated with longer delays in receiving a CT scan or being admitted to a stroke unit, and reduced odds of receiving thrombolysis. After adjusting for casemix, there was no consistent evidence of higher mortality for patients admitted out of hours, but patients admitted at the weekends had a higher risk of 30 day mortality (OR 1.14, 95% CI 1.06–1.21).

Conclusion: Inequalities in the provision of stroke care for people admitted out of regular hours persist in contemporary stroke in England. The association with mortality is small and largely attributable to higher illness severity in patients admitted out of hours.

Citation: Campbell JTP, Bray BD, Hoffman AM, Kavanagh SJ, Rudd AG, et al. (2014) The Effect of Out of Hours Presentation with Acute Stroke on Processes of Care and Outcomes: Analysis of Data from the Stroke Improvement National Audit Programme (SINAP). PLoS ONE 9(2): e87946. doi:10.1371/journal.pone.0087946

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Competing Interests: The authors have declared that no competing interests exist.

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Introduction

Stroke is the third commonest cause of death [1] and the commonest cause of complex disability [2] in the UK. There is evidence that some interventions (for example stroke unit admission [3] and thrombolysis for acute ischaemic stroke [4]) improve outcome. “Out of hours care”, particularly weekend care, is associated with reduced staffing levels, fewer senior staff, more cross cover, and reduced access to imaging and other services [5,6]. Across a number of care settings, including emergency admissions [7,8,9] pulmonary embolism [10] and myocardial infarction [11], admission at nights and weekends is reported to be

associated with worse outcome. Specifically in stroke, there have been a number of studies that suggest that weekend admission is associated with higher in-hospital mortality [12,13]. Admission at weekends with intracerebral haemorrhage, one subtype of stroke, is associated with increased risk adjusted in hospital mortality [14]. There is evidence from a previous cohort in the UK that weekend admissions with acute stroke are less likely to be admitted to a stroke unit, receive thrombolysis or have a CT scan than those admitted during the week [15]. There have been major changes in the organisation of stroke care since this study was published and it is not known if these changes have reduced inequalities in care for patients admitted out of regular working hours.

Table 1. Demographics and unadjusted mortality for normal hours versus out of hours patients.

	Normal hours	Out of hours	All	p value
n (%) (unless otherwise specified)	N = 21947	N = 23779	N = 45726	
Records per site, median (IQR)*	122 (39, 242)	125 (41, 253)	250 (77, 497)	
Sex: Female	11213 (51.1)	12070 (50.8)	23283 (50.9)	
Male	10734 (48.9)	11709 (49.2)	22443 (49.1)	0.478
Age, median (IQR)*	77 (66, 84)	77 (66, 84)	77 (66, 84)	0.067
Males age, median (IQR)*	73 (63, 81)	73 (63, 81)	73 (63, 81)	0.484
Females age, median (IQR)*	80 (71, 87)	80 (71, 87)	80 (71, 87)	0.137
Aged 81 or over	8347 (38.0)	8982 (37.8)	17329 (37.9)	0.567
Independent in everyday activities pre-stroke	17479 (79.6)	18639 (78.4)	36118 (79.0)	0.003
Type of stroke: Infarction	19686 (90.0)	20775 (87.8)	40461 (88.9)	
Primary Intracerebral Haemorrhage	2185 (10.0)	2883 (12.2)	5068 (11.1)	<0.001
OCSF** Stroke classification (Infarct only) TACI	2324 (11.8)	2564 (12.3)	4888 (12.1)	
LACI	3535 (18.0)	3445 (16.6)	6980 (17.3)	
POCI	1873 (9.5)	1848 (8.9)	3721 (9.2)	
PACI	11391 (57.9)	12315 (59.3)	23706 (58.6)	
Other	563 (2.9)	603 (2.9)	1166 (2.9)	<0.001
Worst consciousness level in first 24 hours: Fully conscious	17154 (78.2)	17536 (73.8)	34690 (75.9)	
Drowsy	3124 (14.2)	4012 (16.9)	7136 (15.6)	
Semi-conscious	866 (4.0)	1113 (4.7)	1979 (4.3)	
Unconscious	803 (3.7)	1118 (4.7)	1921 (4.2)	<0.001
Palliative care decision in first 72 hours	1178 (5.4)	1654 (7.0)	2832 (6.2)	<0.001
72 hour mortality	426 (1.9)	548 (2.3)	974 (2.1)	0.007
7 day mortality	1262 (5.8)	1675 (7.2)	2937 (6.5)	<0.001
30 day mortality	2619 (12.1)	3337 (14.3)	5956 (13.2)	<0.001

*Inter quartile range.

**Oxford Community Stroke Project.

doi:10.1371/journal.pone.0087946.t001

We aimed to review data from a large prospective dataset of acute stroke admissions in England to compare the quality of care and mortality in patients admitted out of hours (weekday evenings and overnight, weekends and public holidays) to determine whether inequalities in stroke care for patients admitted out of hours persist.

Methods

The Stroke Improvement National Audit Programme (SINAP) is a continuous, prospective national clinical audit of acute stroke care in England, coordinated by the Royal College of Physicians London. The aim of SINAP is to audit against national guidelines on best practice for stroke patients in order to inform hospitals about their current performance and to identify national performance against key measures. 130 out of 186 (70%) hospitals in England which admit patients with acute stroke submitted data to the audit. Hospitals are encouraged to enter data on all admissions to the hospital with stroke regardless of ward to which they were admitted or what treatment they received. Patients with subarachnoid haemorrhage are not included. Uniformity in approach to data collection is achieved by providing audit participants with help notes on how to interpret the questions in the dataset and a dedicated email and telephone helpdesk to clarify queries about the dataset. The audit documents aspects of process of care in the first 72 hours of admission, including time from

arrival to assessment by the stroke team, to CT scan and to a stroke unit, and interventions such as thrombolysis and administration of anti-platelet agents. Data were submitted by hospitals via a secure web tool with built-in validation checks. Mortality is reported via data linkage with the national death register (the Office for National Statistics).

Patients admitted between 1 April 2010 and 31 January 2012 are included in the cohort. Admission data including time of onset (where known), arrival at hospital time, stroke team assessment time, brain scan time and time of admission to the stroke unit are recorded. The dataset includes patient characteristics (including stroke type and severity) and interventions (such as thrombolysis or admission to stroke unit). There are also 5 care “bundles” which demonstrate the achievement of multiple related care processes on an “all or none” basis. These bundles were defined by the Intercollegiate Stroke Working Party. Patients can be excluded from care bundles based on pre-specified exclusion criteria. ‘Normal hours’ are defined as weekdays between 8am and 6pm and ‘out of hours’ as weekdays before 8am or after 6pm or at any time on a weekend day or English public holiday. Patients who were already in hospital at time of stroke (2,871 patients, 5.9%) are excluded from the analysis. Patients defined in the audit as eligible for thrombolysis have the following characteristics: ischaemic stroke; age less than 81 years; an onset of symptoms to arrival at hospital time of less than 3 hours; no contra-indications for

Table 2. Unadjusted results for processes of care comparing normal hours with out of hours patients.

	Normal hours	Out of hours	All	p value
n (%) (unless otherwise specified)	N = 21947	N = 23779	N = 45726	
Bundle 1	10315 (54.4)	9255 (47.0)	19570 (50.7)	<0.001
Bundle 2	16362 (84.2)	17695 (84.3)	34057 (84.3)	0.484
Bundle 3	12259 (55.9)	11921 (50.1)	24180 (52.9)	<0.001
Bundle 4	11130 (59.5)	11860 (58.7)	23190 (59.1)	0.122
Bundle 5	7451 (41.2)	6845 (35.4)	14296 (38.2)	<0.001
Eligible for thrombolysis	2002 (9.1)	2606 (11.0)	4608 (10.1)	<0.001
Thrombolysed if eligible	1252 (62.5)	1350 (51.8)	2602 (56.5)	<0.001
Given oxygen if required	3578 (68.5)	4379 (72.1)	7957 (70.5)	<0.001
Catheterised (except for retention)	1507 (6.9)	1972 (8.3)	3479 (7.6)	<0.001
Onset to arrival time, median (IQR) in minutes	576 (113, 1010)	349 (97, 1120)	462 (103, 1063)	<0.001
Arrival to stroke unit time, median (IQR) in minutes	209 (120, 383)	227 (127, 741)	218 (123, 505)	<0.001
Arrival to scan time, median (IQR) in minutes	114 (44, 285)	155 (46, 850)	130 (45, 644)	<0.001

- Bundle 1: The patient was seen by a nurse (trained in stroke management) and one therapist within 24 hours of hospital arrival and all relevant therapists within 72 hours.
- Bundle 2: The patient had a nutrition screening and, when required, a formal swallow assessment within 72 hours.
- Bundle 3: The patient's first ward of admission was a stroke unit and they arrived there within four hours of hospital arrival.
- Bundle 4: The patient was given an antiplatelet, when appropriate, within 72 h and adequate fluid and nutrition in all 24 hour periods.
- Bundle 5 includes the following stroke standards: Admitted to stroke unit within 4 hours; Scanned within 24 hours; Seen by stroke consultant or associate specialist within 24 hours; Saw nurse within 24 hours; Nutrition screening within 72 hours; Prognosis/diagnosis discussed with relatives/carers within 72 hours; Physiotherapy assessment within 72 hours.

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thrombolysis; and did not decline treatment. These eligibility criteria are based on European licensing indications at the time.

The aim of our study was to determine whether patients admitted out of hours to hospital with acute stroke have worse care or higher mortality than people admitted within hours. Logistic regression was used to test the relationship between arrival category and outcomes. Mortality was analysed at 72 hours, 7 days and 30 days after admission. Sensitivity analyses were carried out in which patients dying within the first 3 days following admission were excluded, on the basis that such early mortality may be a marker of stroke severity and co-morbidities, rather than reflect process of care. A further sensitivity analysis was carried out

adjusting for stroke syndrome type using the Oxford classification [16] (OCSP). A Cox proportional hazards model was used to test the relationship between arrival category and time taken for patients to progress along the stroke care pathway. In this analysis, a hazard ratio above one is interpreted as faster progress, and below one as slower progress. Analyses were adjusted for age, sex, worst level of consciousness in the first 24 hours (a surrogate for stroke severity), stroke type (ischaemic versus primary intracerebral haemorrhage) and pre stroke independence. Regression analysis results are presented as odds ratios or hazard ratios with analytical 95% confidence intervals. Categorical data are presented as N (%),

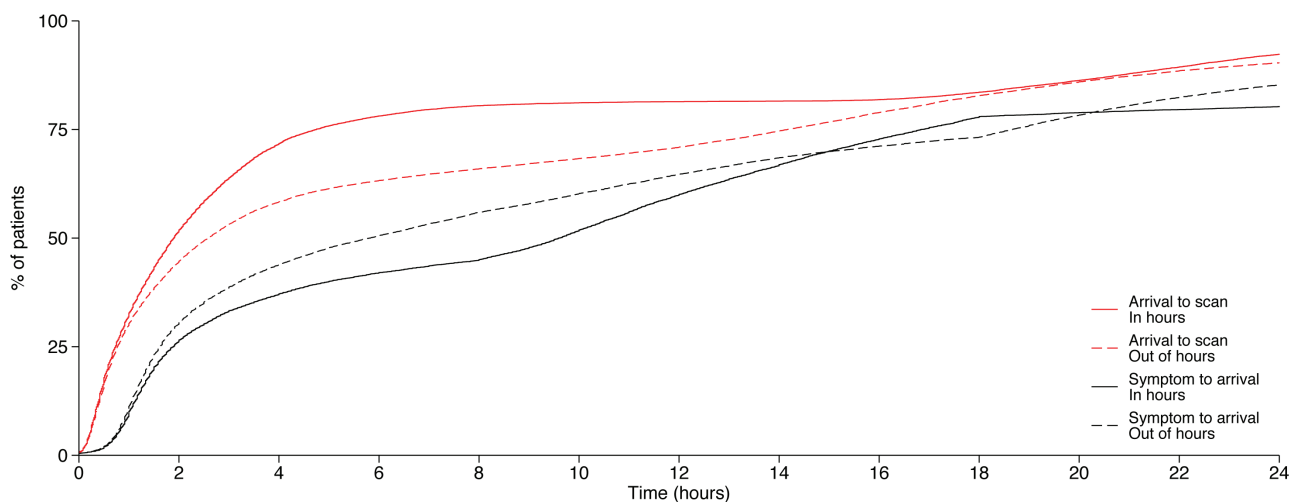


Figure 1. Cumulative frequency plot of arrival to scan and symptom to arrival delays for normal hours and out of hours patients. doi:10.1371/journal.pone.0087946.g001

Table 3. Adjusted results for processes of care comparing normal hours with out of hours patients.

	N of patients	Univariable		Multivariable*	
		OR	p	OR	p
Bundle 1 (nursing and therapy)	38504	0.74 (0.71–0.77)	<0.001	0.74 (0.71–0.77)	<0.001
Bundle 2 (nutrition screen and swallow assessment)	40270	1.02 (0.97–1.08)	0.48	1.02 (0.97–1.08)	0.44
Bundle 3 (stroke unit direct admission)	45529	0.79 (0.77–0.82)	<0.001	0.80 (0.77–0.83)	<0.001
Bundle 4 (fluid/nutrition/antiplatelet)	39113	0.97 (0.93–1.01)	0.12	1.02 (0.98–1.07)	0.32
Bundle 5	37292	0.78 (0.75–0.81)	<0.001	0.78 (1.75–0.81)	<0.001
Eligible for thrombolysis	40461	1.27 (1.19–1.35)	<0.001	1.25 (1.17–1.33)	<0.001
Thrombolysed if eligible	4608	0.64 (0.57–0.73)	<0.001	0.62 (0.55–0.70)	<0.001
Given oxygen if required	11236	1.19 (1.09–1.29)	<0.001	1.13 (1.03–1.23)	0.007
Catheterised (except for retention)	45529	1.23 (1.14–1.32)	<0.001	1.10 (1.02–1.18)	0.011
	N	HR	p	HR	p
Onset to arrival time	40138	1.12 (1.10–1.14)	<0.001	1.10 (1.08–1.13)	<0.001
Arrival to stroke unit time	42601	0.86 (0.85–0.88)	<0.001	0.87 (0.85–0.89)	<0.001
Arrival to scan time	42601	0.85 (0.84–0.87)	<0.001	0.84 (0.85–0.89)	<0.001

*Adjusted for age, sex, worst level of consciousness in the first 24 hours, stroke type and pre-stroke independence. Odds and hazard ratios for achieving each of the process measures. Reference category is normal hours patients. doi:10.1371/journal.pone.0087946.t003

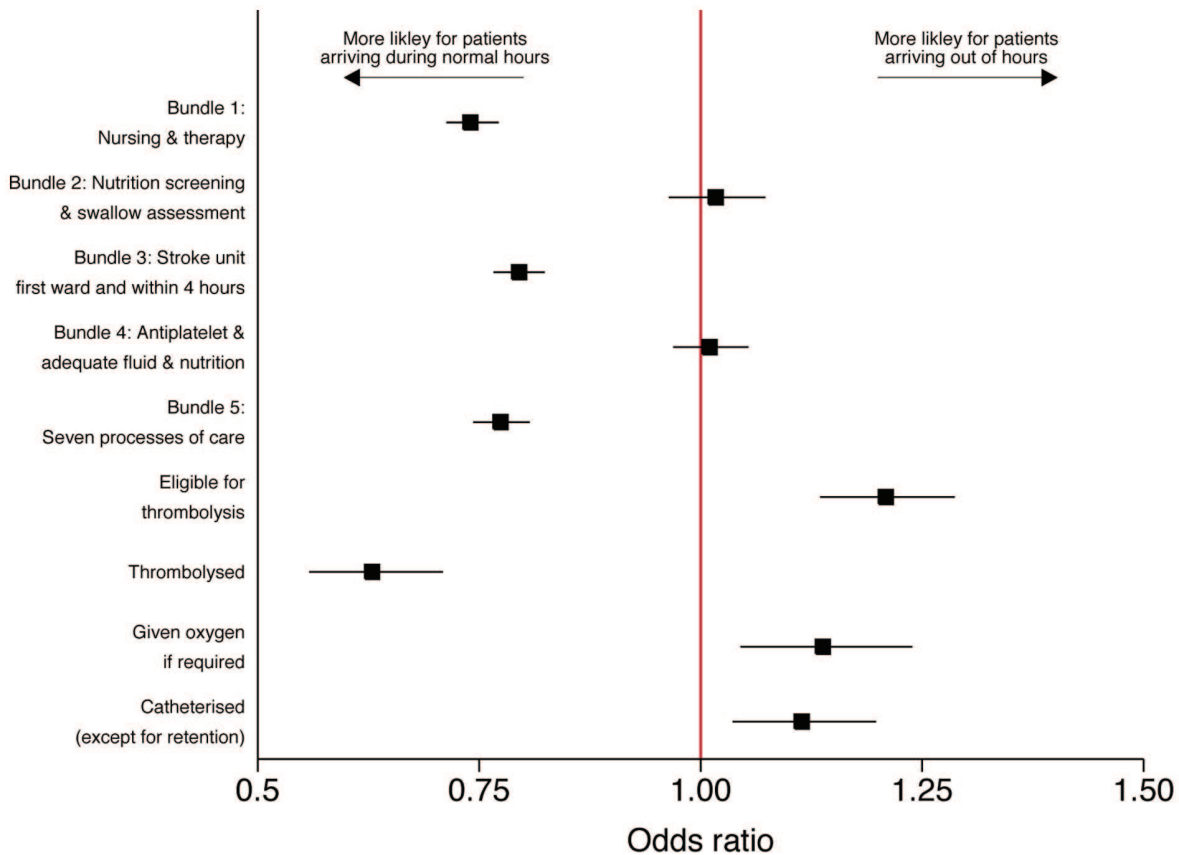


Figure 2. Eligibility for and compliance with process measures for normal hours and out of hours patients (adjusted odds ratios). doi:10.1371/journal.pone.0087946.g002

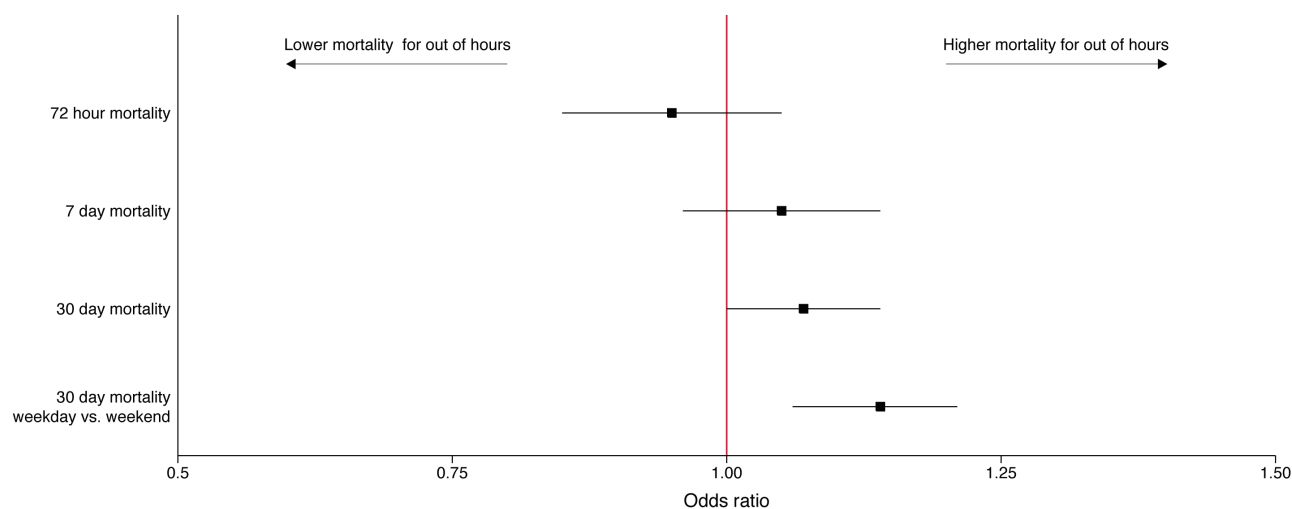


Figure 3. Adjusted mortality odds ratios for normal hours and out of hours patients.
doi:10.1371/journal.pone.0087946.g003

and continuous data are presented as mean (SD) or median (IQR) as appropriate. All analysis was performed using Stata 12.1.

Ethics Statement

Ethical approval of the SINAP audit and associated data linkage was granted by the Ethics and Confidentiality Committee of the National Information Governance Board. This included Section 251 (under the NHS Act 2006) approval to collect data without active patient consent and patients are able to request for any identifiable data to not be included. Patients and patient representatives are involved in the design, reporting and oversight of SINAP.

Results

Of the 45,726 stroke patients, 21,947 patients (48%) arrived at hospital within normal hours and 23,779 patients (52%) arrived out of hours. Whilst the two groups were similar in terms of age and sex, there were significant clinical differences between them [Table 1]. There were a greater proportion of patients with primary intracerebral haemorrhage amongst the out of hours group (12.2% versus 10.0%, $p < 0.0001$), fewer patients with lacunar infarct (16.6% versus 18.0%, $p < 0.001$) and fewer patients who were fully conscious in the first 24 hours (73.8% versus 78.2%, $p = 0.003$). In univariable analysis, out of hours patients had a significantly higher mortality at 72 hours (2.3% versus 1.9%, $p = 0.007$), 7 days (6.5% versus 5.8%, $p < 0.001$) and 30 days (14.3% versus 12.1%, $p < 0.001$).

In univariable analysis, there was a significant difference (favouring normal hours arrivals) in the proportion of patients receiving several audited processes of care (Table 2). A higher proportion of patients arriving in normal hours received Bundles 1, 3 and 5 and thrombolysis if eligible, and a lower proportion were catheterised. These patients also had faster arrival to scan (Figure 1; median 114 minutes *versus* 155 minutes, $p < 0.001$) and arrival to stroke unit times. There was no significant difference between the two arrival groups for Bundles 2 and 4. A greater proportion of out of hours patients were estimated to be eligible for thrombolysis, based on shorter times from onset to admission (median 349 *versus* 576 minutes, $p < 0.001$) (Table 2 and Figure 1).

Similar associations were observed in the multivariable analysis of process of care [Table 3 and Figure 2]. Out of hours patients had a higher odds being eligible for thrombolysis (OR 1.25, 95% CI 1.17–1.33, $p < 0.001$), but reduced odds of receiving it if eligible (OR 0.62, 95% CI 0.55–0.70, $p < 0.001$). The adjusted mortality results are shown in Figure 3 and Table 4. After adjusting for patient casemix, there were no significant differences in 72 hour and 7 day mortality for out of hours admissions. There was a small higher risk of 30 day mortality, but only at a borderline level of statistical significance (OR 1.07, 95% CI 1.00–1.14, $p = 0.040$). Using a different measure of out of hours (weekends but not overnight) yielded a slightly higher odds ratio of death (OR 1.14, 95% CI 1.06–1.21, $p < 0.001$). In sensitivity analysis, excluding the 72 hour deaths increased the odds ratio of 30 day mortality for out of hours patients, (OR 1.10, 95% CI 1.03–1.18, $p = 0.008$). Patients admitted out of hours were not at higher risk of mortality when adjusting for OCSF subtype (OR 0.96, 95% CI 0.86–1.06, $p = 0.41$).

Discussion

This study shows that there are significant differences both in the patient population admitted with stroke out of usual working hours, and in the quality of the care that they receive. Patients admitted out of hours are more likely to present with haemorrhagic stroke, have reduced consciousness and have pre-morbid dependency; those patients with ischaemic stroke are more likely to present with more severe stroke subtypes. These data suggest that the observed excess mortality associated with out of hours admission reported in previous studies can largely be explained by un-measured differences in severity and prognosis. However, despite presenting with a greater illness severity, patients admitted out of hours are also less likely to receive timely access to key investigations and interventions, such as brain scanning and stroke unit admission. These data show that in this large sample of contemporary stroke care in England, there remain significant inequalities in care standards depending on the time of day and day of week that a patient has a stroke.

Table 4. Adjusted mortality results.

	N of patients	Univariable		Multivariable*	
		OR	p	OR	p
72 hour mortality	44783	1.17 (1.06–1.29)	0.002	0.95 (0.85–1.05)	0.32
7 day mortality	44783	1.24 (1.15–1.34)	<0.001	1.05 (0.96–1.14)	0.28
30 day mortality	44783	1.21 (1.14–1.27)	<0.001	1.07 (1.00–1.14)	0.040
30 day mortality comparing weekend admission with weekday admission	44783	1.24 (1.16–1.32)	<0.001	1.14 (1.06–1.21)	<0.001

*Adjusted for age, sex, worst level of consciousness in the first 24 hours, stroke type and pre-stroke independence. Reference category is normal hours patients, except for last row which is patients admitted any time on a weekday.
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Comparison with Other Studies

Several previous observational studies have demonstrated excess mortality associated with out of hours or weekend admission for acute stroke, although the effect size has generally been modest and not all studies have demonstrated such an effect. In the largest previous cohort study from England, patients admitted on a Sunday were found to have 26% higher odds of inpatient mortality compared to those admitted on a weekday [17]. However, the study was based on administrative data returns and was therefore limited in its ability to control for stroke severity between weekend and weekday admissions. Data from the Canadian Stroke Registry showed a similar excess risk of 7 day mortality in patients admitted at weekends [18]. More modest estimates of excess mortality risk were observed in data from the US Get With The Guidelines register, where out-of-hours admission was associated with 9% and 19% higher odds of in-patient mortality in patients with ischaemic stroke and haemorrhagic stroke respectively [13]. By contrast, studies in other settings have not observed higher mortality in weekend admissions [19,20]. In our study, no significant differences were observed in mortality at 72 hours or 7 days for patients admitted out of hours when adjusting for patient casemix. 30 day mortality was higher in some but not all of the analyses, and with only borderline levels of statistical significance. These suggest that more complete adjustment for casemix can explain most if not all of the observed excess mortality for patients admitted out of hours. Patients admitted out of hours had a greater number of features associated with worse prognosis (such as haemorrhagic stroke, reduced consciousness, dependency in activities of daily living prior to stroke). These differences in casemix may reflect differences in access to community medical care services out of hours, less awareness of minor stroke symptoms that occur during sleep or reduced propensity of patients to seek medical attention out of regular hours. Interestingly, patients admitted out of hours presented to hospital quicker after the onset of their symptoms. This may reflect greater urgency in referral and transfer to hospital in response to more severe acute symptoms (such as reduced consciousness) or possibly may reflect differences in pre-hospital transport (reduced demand for ambulances, lower traffic levels) for out of hours admissions.

There was a stronger association with weekend admission and mortality, which was associated with a 14% higher odds of 30 day mortality. The reasons for differences between weekend admission compared to a broader definition of out of hours care (including overnight admissions) are not clear. It is possible that the effect of weekend admission on mortality relates to the prolonged period of exposure to out of hours working (up to 56 hours versus up to 14 hours for overnight admissions).

This study found significant differences in the quality of care received by patients admitted out of hours. Patients admitted out of hours waited longer to receive a brain scan or be admitted to a stroke unit and were less likely to be admitted to a stroke unit directly or to receive thrombolysis, multidisciplinary stroke specific care and therapy early after admission (Bundle 1). Other aspects of care quality were equivalent, including nutritional and swallow screening and administration of antiplatelet therapy, adequate fluid and nutrition. Differences in care quality may reflect the differences in the organisation of out of hours care – access to brain scanning may be restricted out of hours, and many hospitals have reduced nursing and medical staff rostered at weekends [16]. In particular, the difference in thrombolysis rates suggests that patients admitted out of hours have inequitable access to one of the key evidence based therapies for acute stroke [4]. This is even more unfortunate given that patients presenting out of hours presented quicker to hospital and thus potentially have most to gain from timely administration of thrombolysis [21].

These findings are similar to those reported in the United Kingdom from 2005, which demonstrated reduced access to early CT scanning and stroke unit admission for weekend admissions. Since then, changes in stroke service organisation in England have significantly increased the number of stroke unit beds and CT scan availability (RCP Sentinel Audit 2010). These data show however that these improvements have not eradicated inequality in stroke care arising from out of hours admission. There is evidence that reorganisation for stroke care can reduce these inequalities – outcomes from out-of-hours admissions to Comprehensive Stroke Centres in the USA has been reported as being no worse for weekend admissions [20].

Strengths and limitations

These data represent a large, national cohort of patients, with high levels of data completeness and linkage with national mortality records to generate accurate estimates of mortality rates. Several previous studies have used in-patient mortality as the outcome of interest: this may underestimate true mortality rates, particularly in a changing health care environment where patients may be discharged early to nursing home or intermediate care facilities. The dataset is also specifically designed to capture accurate information concerning the process of acute stroke care, and therefore is likely to give more accurate estimates than those derived from routine coding of administrative data. The outcomes data are however limited to mortality, and no data was available on other important stroke outcomes such as disability and quality of life. It is therefore not possible to determine if inequalities in process of care for patients admitted out of hours influenced these outcomes. Adjustment for stroke severity also was limited by lack

of availability of the National Institutes of Health Stroke Scale (NIHSS), which is commonly used in stroke research, and other prognostic variables such as cardiovascular comorbidities. Adjustment for stroke severity was therefore carried out using other measures of severity (consciousness level and OCSF subtype). SINAP is not a population based register, and hospital participation is voluntary. Differences in case ascertainment and reporting between hospitals cannot therefore be excluded. Both the voluntary participation and differing case ascertainment may be a source of bias as non-participating hospitals may have different processes of care. Nevertheless, our results are based on patient level data rather than hospital level, so the effect of low and non-participation should not be overstated.

Summary

Despite improvements in the organisation of stroke care in England over recent years, significant inequalities in care remain for patients with acute stroke admitted out of regular working hours. Observed excess mortality for patients admitted with stroke out of hours are largely explained by higher illness severity,

although patients admitted at the weekend had a small but significant increased risk of mortality. Despite worse illness severity, patients admitted out of hours wait longer for key investigations and interventions, and are less likely to receive several aspects of multidisciplinary stroke care. Strategies to improve 24/7 emergency care generally should allow more hospitals to provide high quality specialist care regardless of time of presentation.

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Author Contributions

Conceived and designed the experiments: JC AH SK AR PT. Performed the experiments: JC AH SK. Analyzed the data: BB JC. Wrote the paper: JC PT BB. Revised manuscript: AH AR.

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