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New models of care supported by diagnostic technology

Prof Dan Lasserson MA MD FRCP Edin MRCGP
Senior Interface Physician in Acute and Complex Medicine, Dept of Geratology
Associate Professor, Nuffield Department of Medicine
Clinical Lead for Diagnostics and Pathways, Oxford AHSN

@DanLasserson

Oxford Biomedical Research Centre

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- Delivering ambulatory emergency care
  - POC diagnostics as critical enablers
- Accuracy and utility in care pathways
- Which diagnostics do we need to support new care models?

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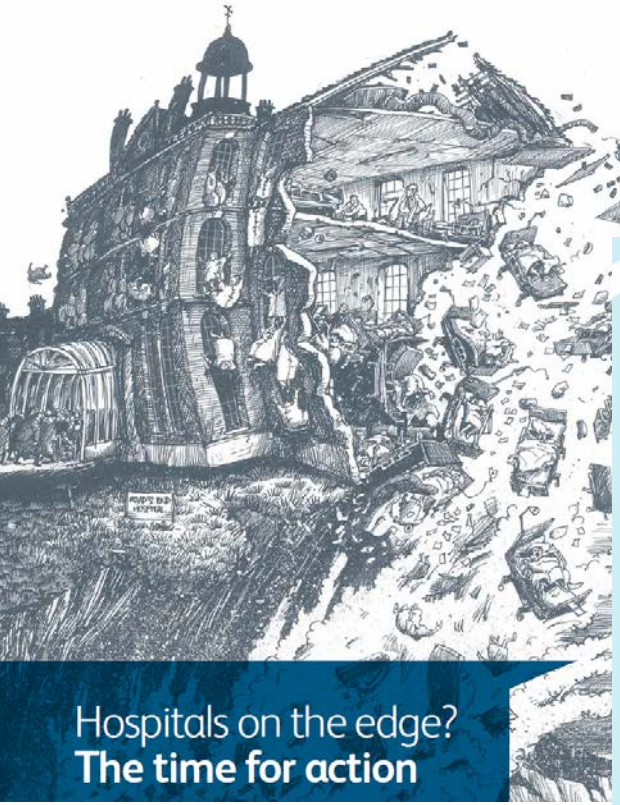

Future hospital: Caring for medical patients

A report from the Future Hospital Commission to the Royal College of Physicians

September 2013

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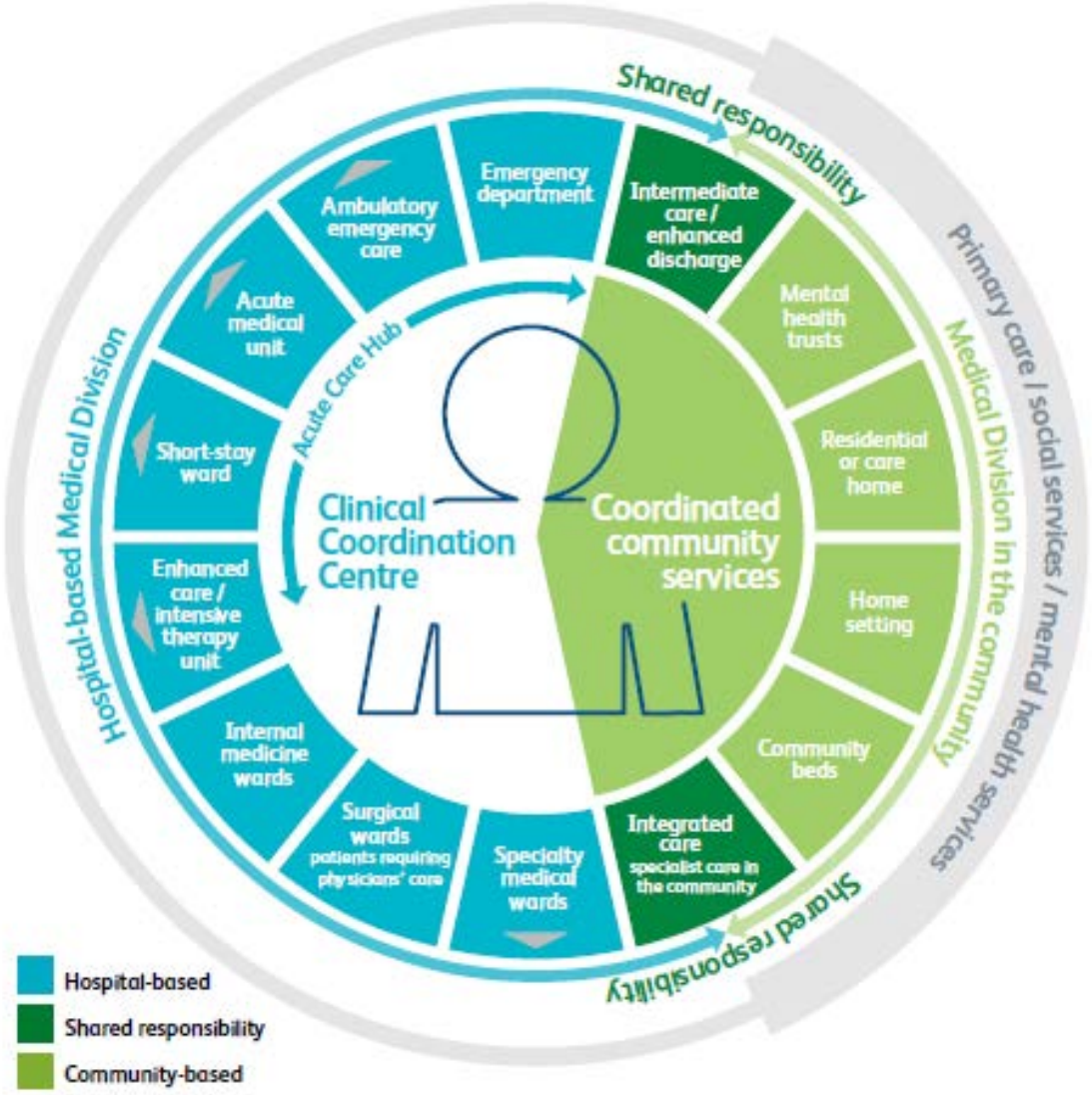
Future Hospital Principles – the interface with the community

- A Medical Division that has in-hospital and community based components
- Ambulatory emergency care should be the default for all patients, unless admission required on clinical need
- Develop specialist models of care that operate beyond the ‘hospital walls’, providing care integrated with community providers/GPs, particularly into care homes
- Clinical Coordination centre that can match care needs with capacity/capability across the health economy (to include Urgent Care, Out of Hours care, Medical Division)

The hospital - community interface



What is ambulatory emergency care?

- Diagnosis, observation, treatment, rehabilitation not provided in the traditional hospital bed base or out-patients
- Improved patient experience, reduce negative impact of hospital admission, cost-effectiveness
- Needs observation periods, **rapid diagnostics**, decision-makers, reassessments
- Communication with a ‘capable community’

A Post Hospital Syndrome?

- Medicare readmissions in US (>65 years) after index admissions for acute MI, pneumonia, heart failure
- 18-25% readmitted within 30 days, mostly with different conditions
- Interpreted as a ‘transient, acquired generalised increase in risk for multiple conditions’

JAMA 2013;309 (4): 355-363

NEJM 2013;368:100-102

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Delivering ambulatory emergency care

- Community based acute multidisciplinary assessment and treatment
- Working outside the ‘hospital walls’
- Integrated working with community partners
- Improve patient and carer experience of acute assessment and treatment

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Emergency Multidisciplinary Unit (EMU)

- Accessible, rapid, multidisciplinary diagnosis and treatment from a community setting
- Credible alternative to acute hospital admission
- Personalised acute care process, tailored to risk, patient and carer preference
- Platform for innovation in care models for older patients living with frailty

Emergency Multidisciplinary Unit (EMU)

Investigations

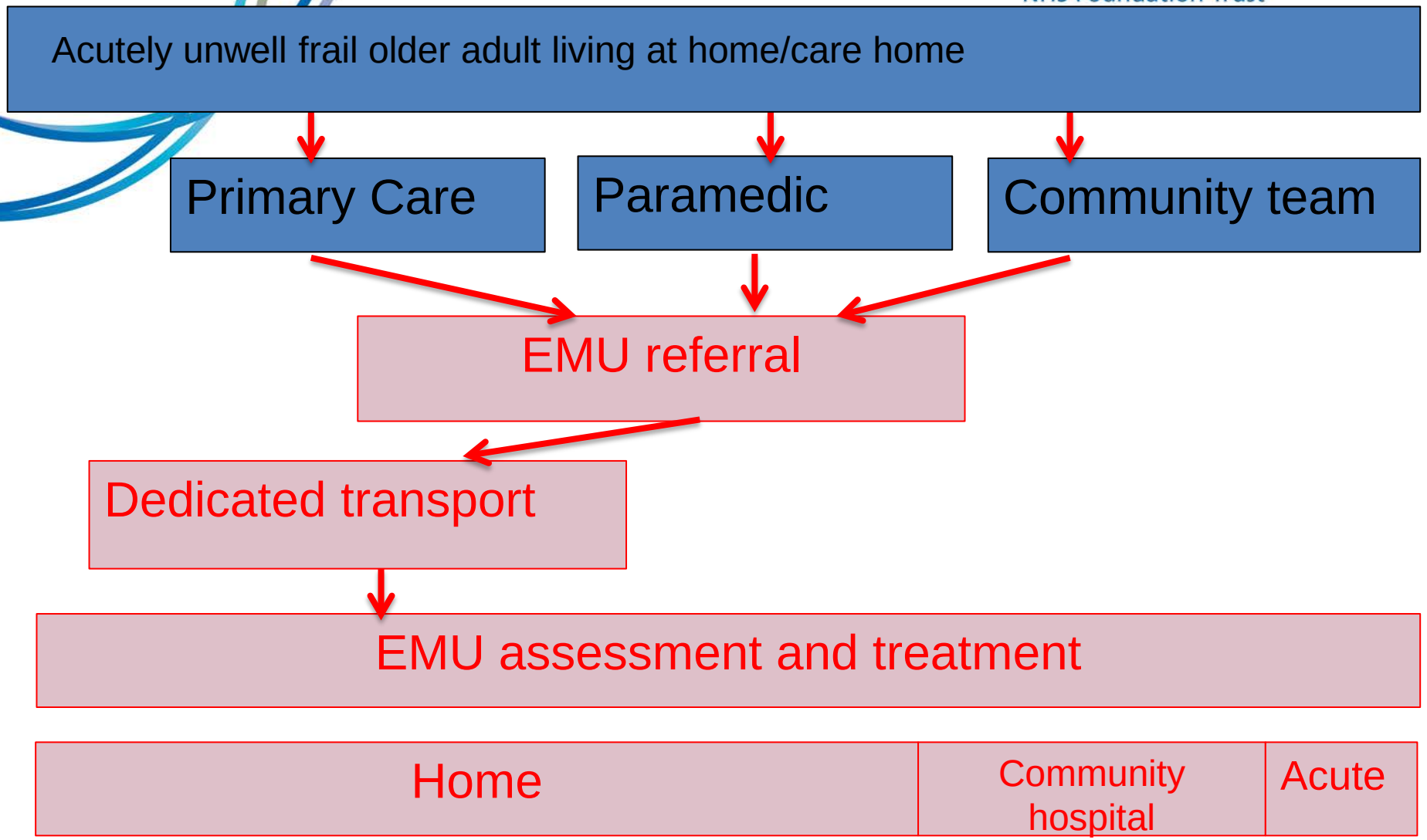
- **POC bloods** Na, K, urea, creatinine, calcium, glucose, blood gases, lactate, INR, haemoglobin, troponin, CRP
- **Plain X-Ray** (no cross-sectional imaging)

'**Interface multidisciplinary team care**': delivers enabling care **alongside** interventions traditionally delivered in an acute hospital, in settings close to home

- Intravenous fluid, diuresis, antibiotics, blood products
- Frequent assessment/monitoring (therapist, nursing, social, medical care)

Care Pathways

- Ambulatory care
- Bed based care (community or acute)


Acutely unwell frail older adult living at home/care home
Primary Care
Paramedic
Community team
EMU referral
Dedicated transport
EMU assessment and treatment
Home
Community hospital
Acute

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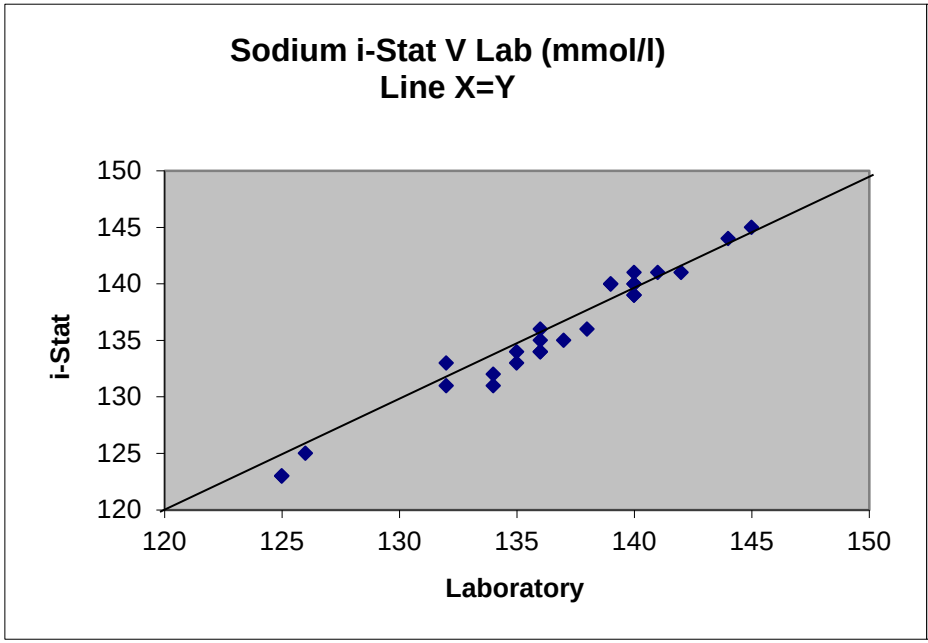
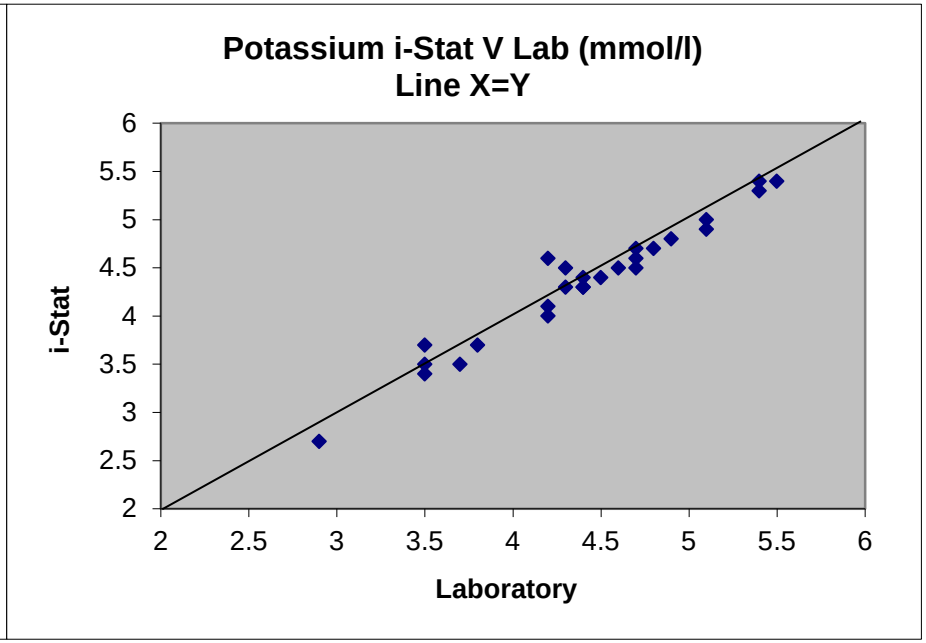
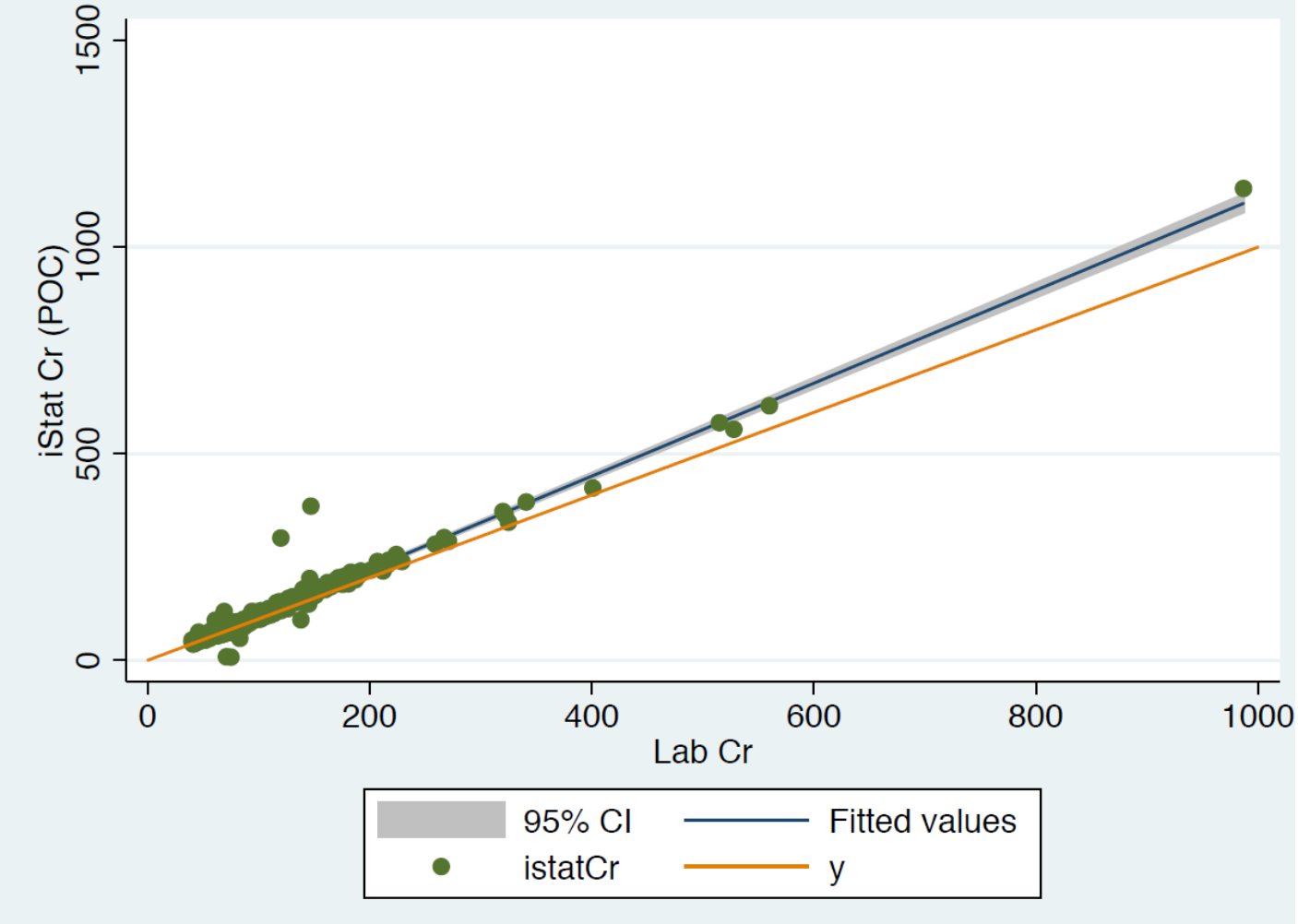
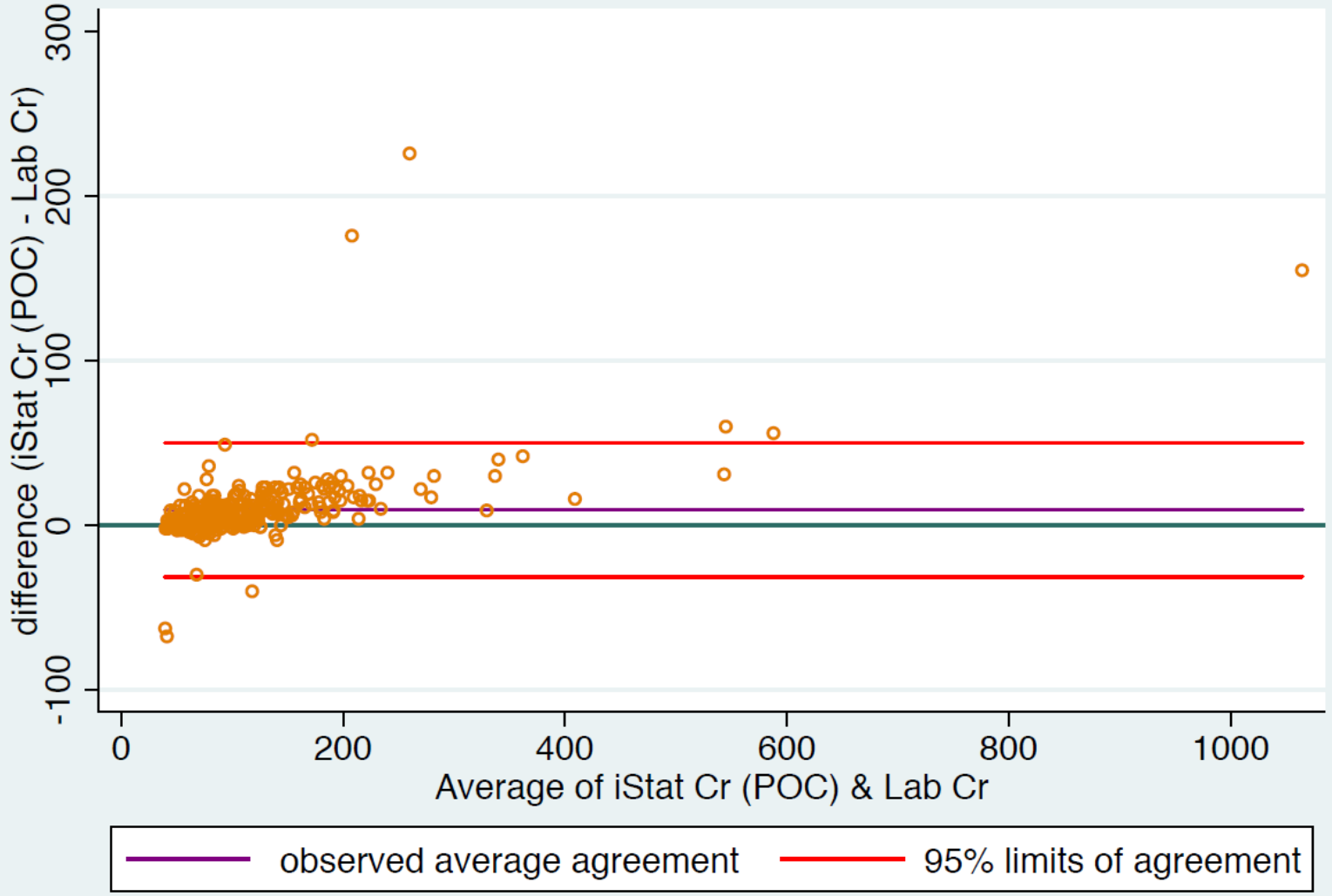
Point of Care vs Laboratory – controlled lab based studies

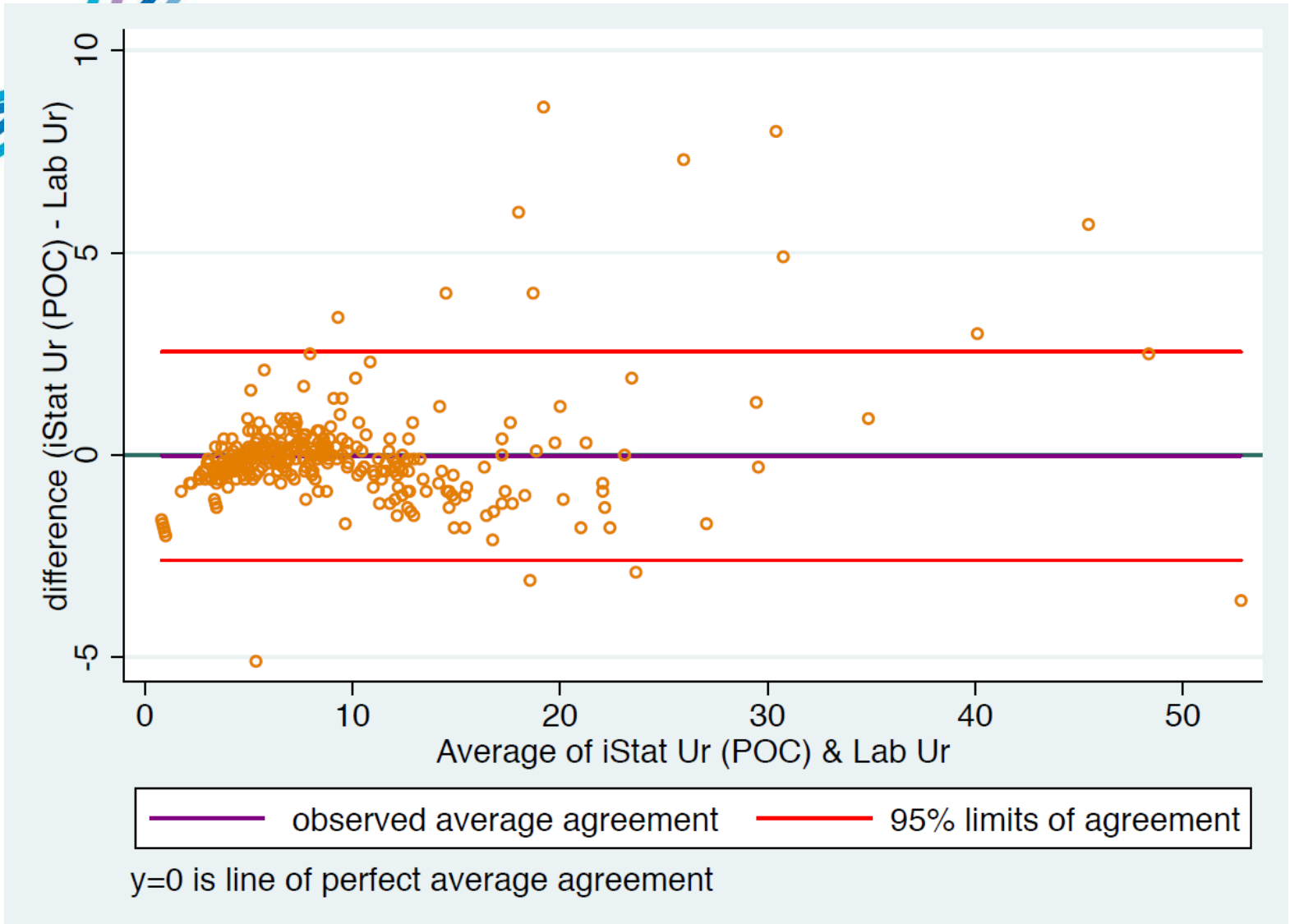


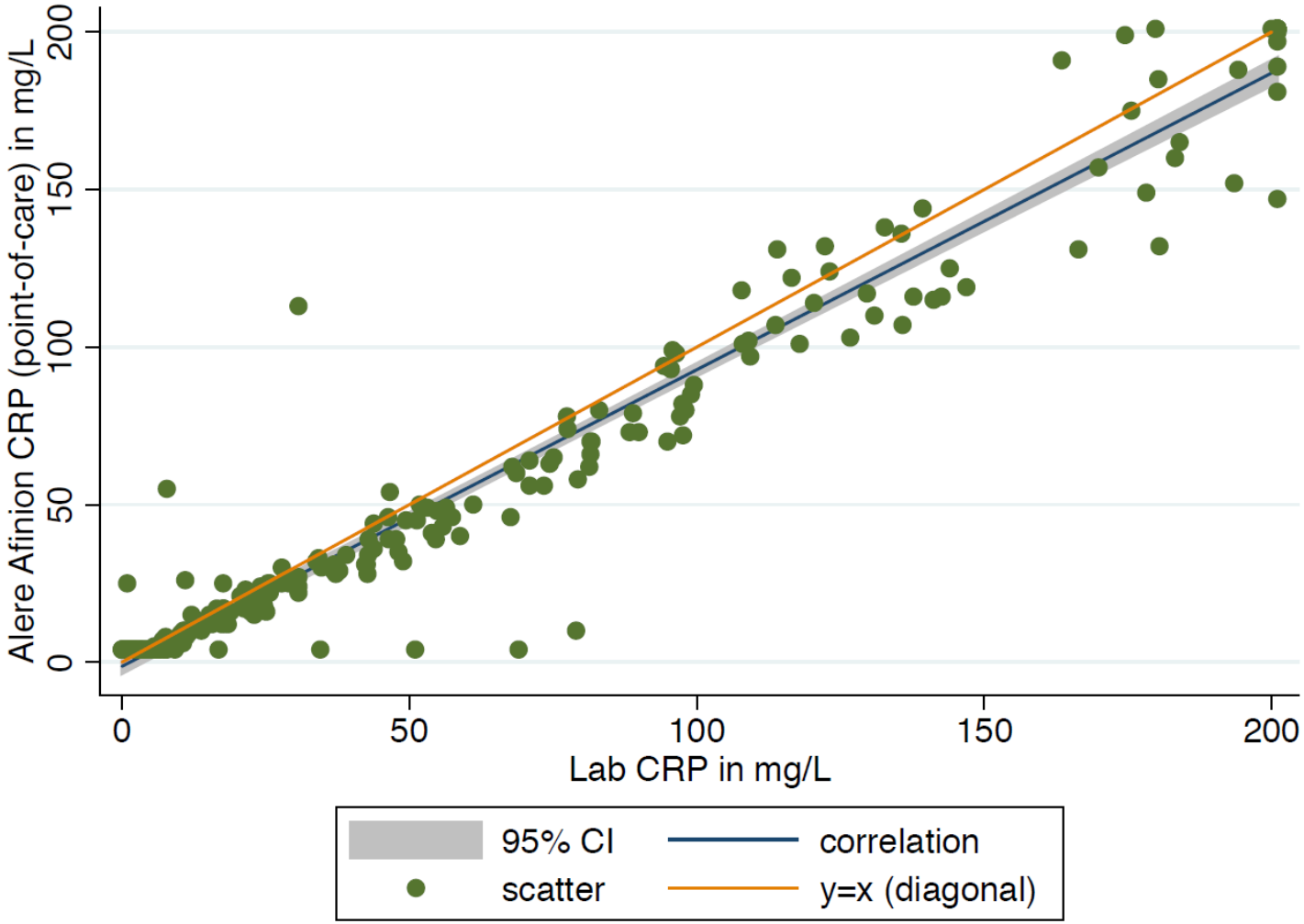


Point of Care vs Laboratory in routine clinical use

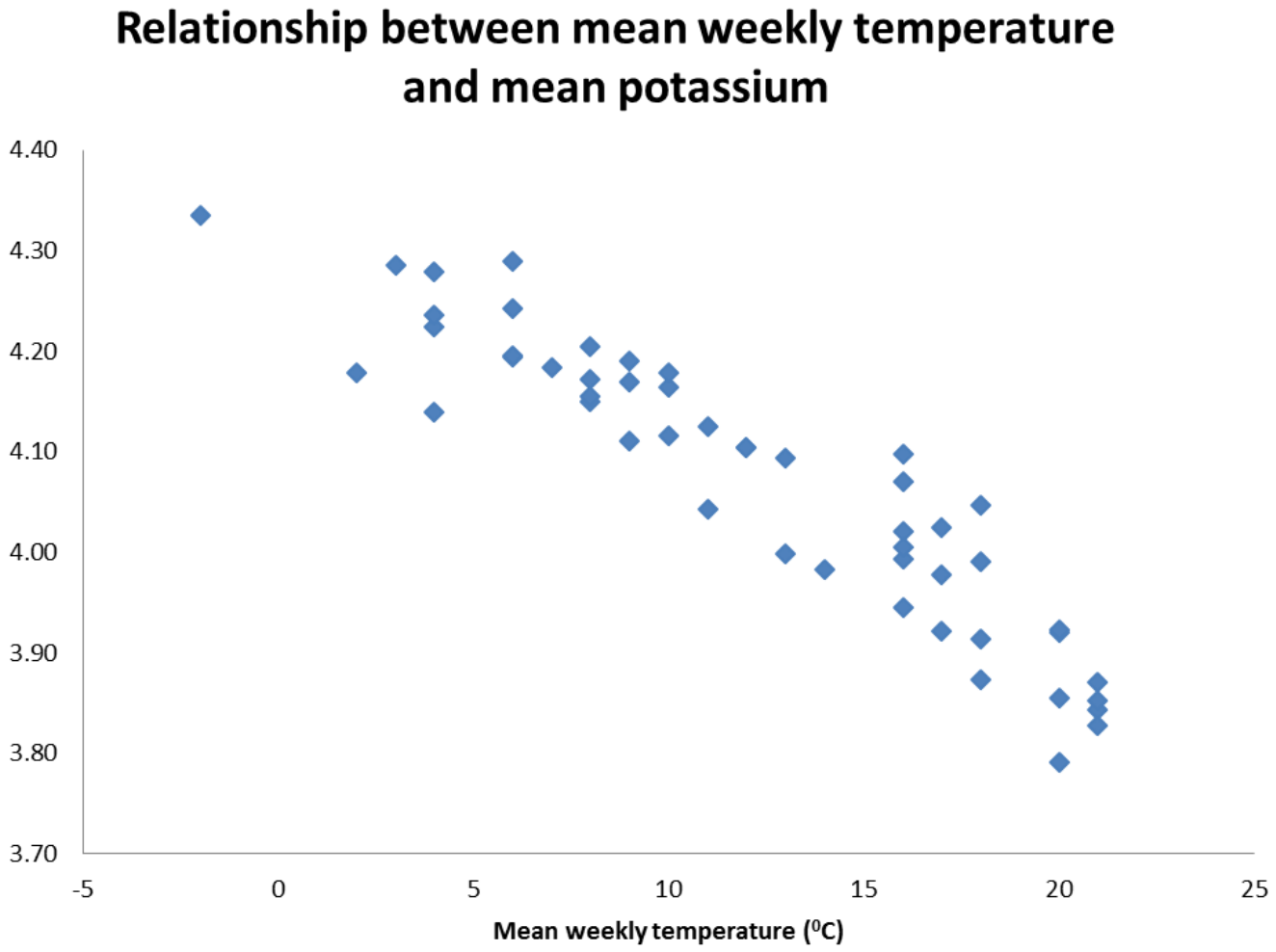



difference (iStat Cr (POC) - Lab Cr)
300
200
100
0
-100
0
200
400
600
800
1000
Average of iStat Cr (POC) & Lab Cr
observed average agreement
95% limits of agreement
y=0 is line of perfect average agreement


difference (iStat Ur (POC) - Lab Ur)
10
5
0
-5
0
10
20
30
40
50
Average of iStat Ur (POC) & Lab Ur
observed average agreement
95% limits of agreement
y=0 is line of perfect average agreement


Alere Afinion CRP (point-of-care) in mg/L
0
50
100
150
200
Lab CRP in mg/L
95% CI
correlation
scatter
y=x (diagonal)

Importance of POC testing in community settings



Bringing community innovation back in to the hospital

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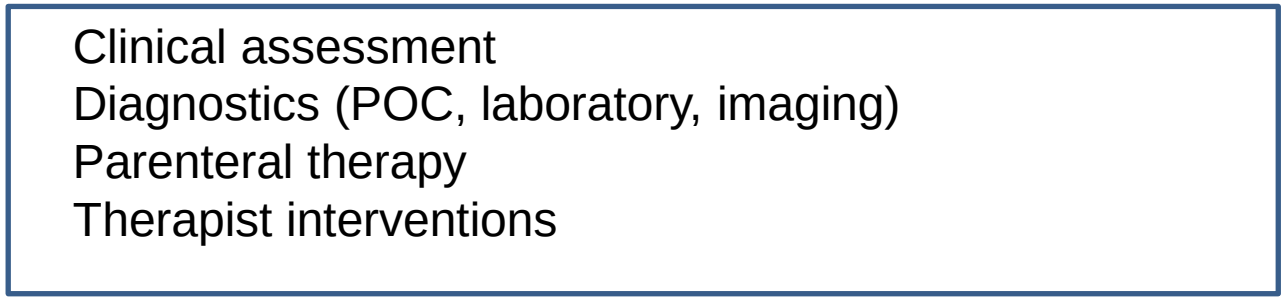
Patient flow – referral and in-reach



No further follow up after initial assessment

Ambulatory treatment pathway

Small % of patients with short acute stay

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Selecting patients for ambulatory emergency care

- Fundamental element of Future Hospital report is ambulatory emergency care

- What is the level of agreement over which patients are suitable to be ambulated in acute illness?

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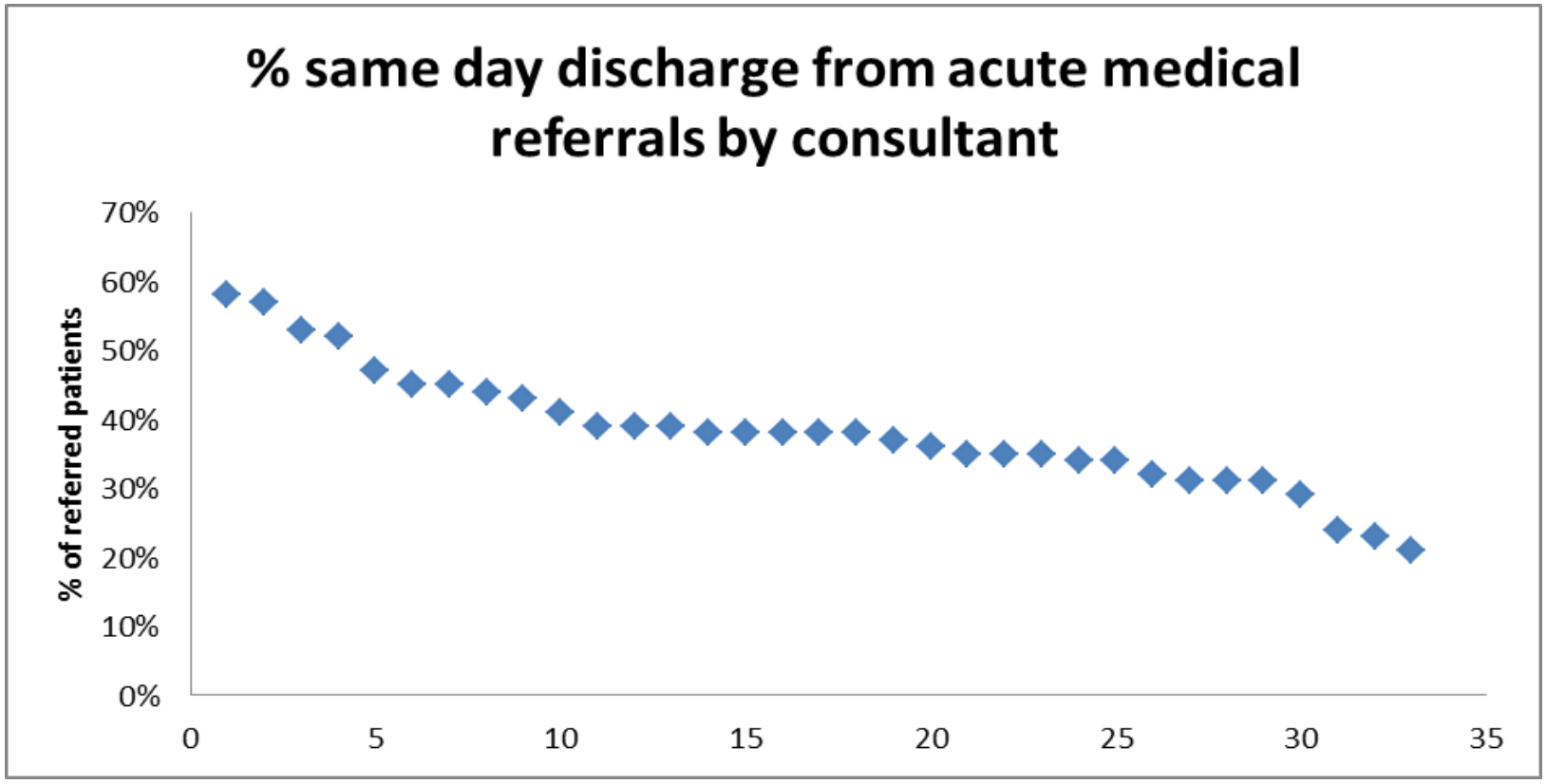
Selecting patients for ambulatory emergency care



Selecting patients for ambulatory emergency care

- 533 consecutive acute referrals
  - median age 80 yrs, 59% female, mean Barthel = 16.7
  - 11% referred by paramedics, 85% referred by GPs
  - 13.3% from care home/supported living
  - Of those living at home 23% had a care package, 40% living alone

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Selecting patients for ambulatory emergency care

- 533 consecutive acute referrals - presentations
  - 48% decreased mobility/functional decline
  - 37% breathlessness
  - 20% falls
  - 18% acute confusion
  - 43% deemed to have increased care needs

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Selecting patients for ambulatory emergency care

- Pathway outcomes at 30 days after referral
  - 61% remained on an ambulatory pathway
  - 10% initially ambulatory then escalated to acute care
  - 28% initially admitted
    - 9% transfer to acute hospital bed
    - 19% admitted to community hospital bed

Markers of physiological status – NEWS

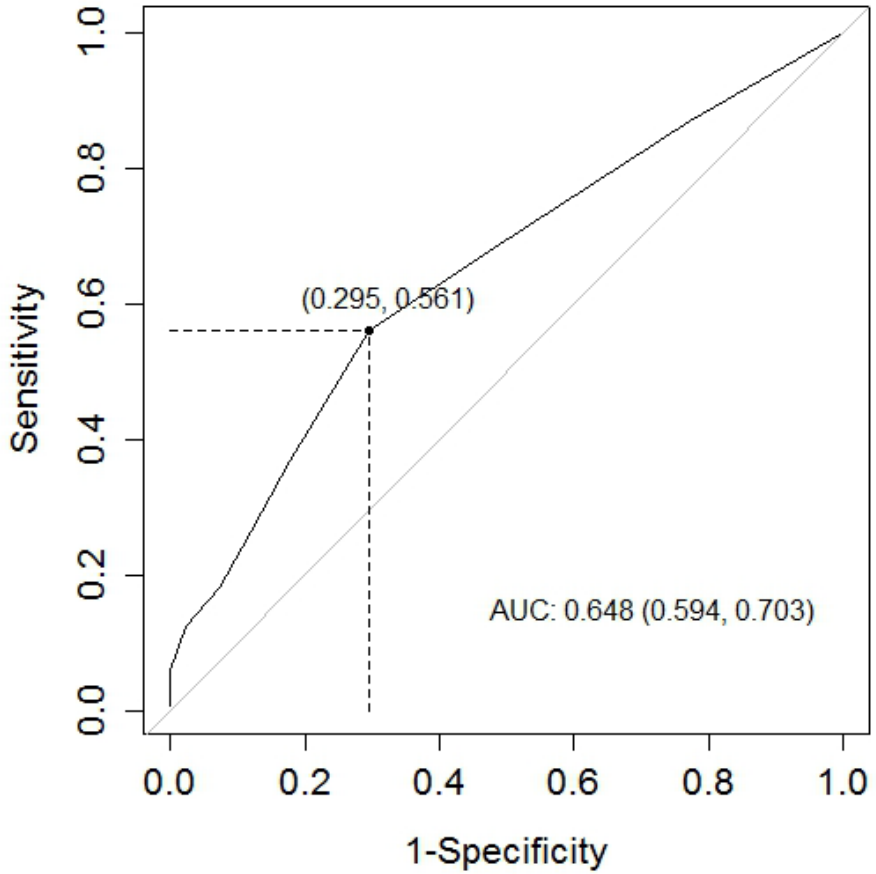
PHYSIOLOGICAL PARAMETERS	3	2	1	0	1	2	3
Respiration Rate	≤8		9 - 11	12 - 20		21 - 24	≥25
Oxygen Saturations	≤91	92 - 93	94 - 95	≥96			
Any Supplemental Oxygen		Yes		No			
Temperature	≤35.0		35.1 - 36.0	36.1 - 38.0	38.1 - 39.0	≥39.1	
Systolic BP	≤90	91 - 100	101 - 110	111 - 219			≥220
Heart Rate	≤40		41 - 50	51 - 90	91 - 110	111 - 130	≥131
Level of Consciousness				A			V, P, or U

*The NEWS initiative flowed from the Royal College of Physicians' NEWSDIG, and was jointly developed and funded in collaboration with the Royal College of Physicians, Royal College of Nursing, National Outreach Forum and NHS Training for Innovation.

Royal College of Physicians

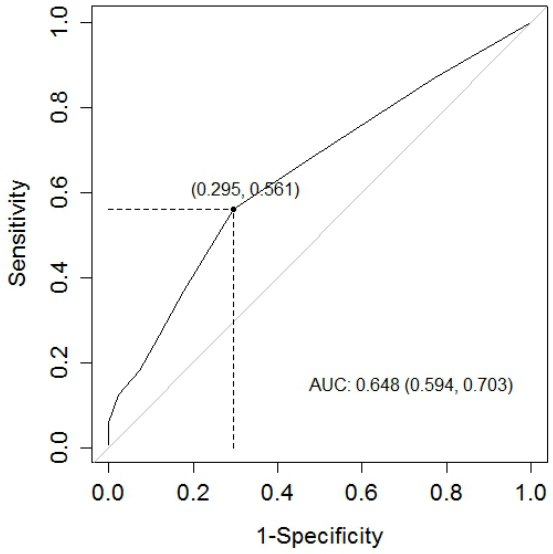
NHS Training for Innovation

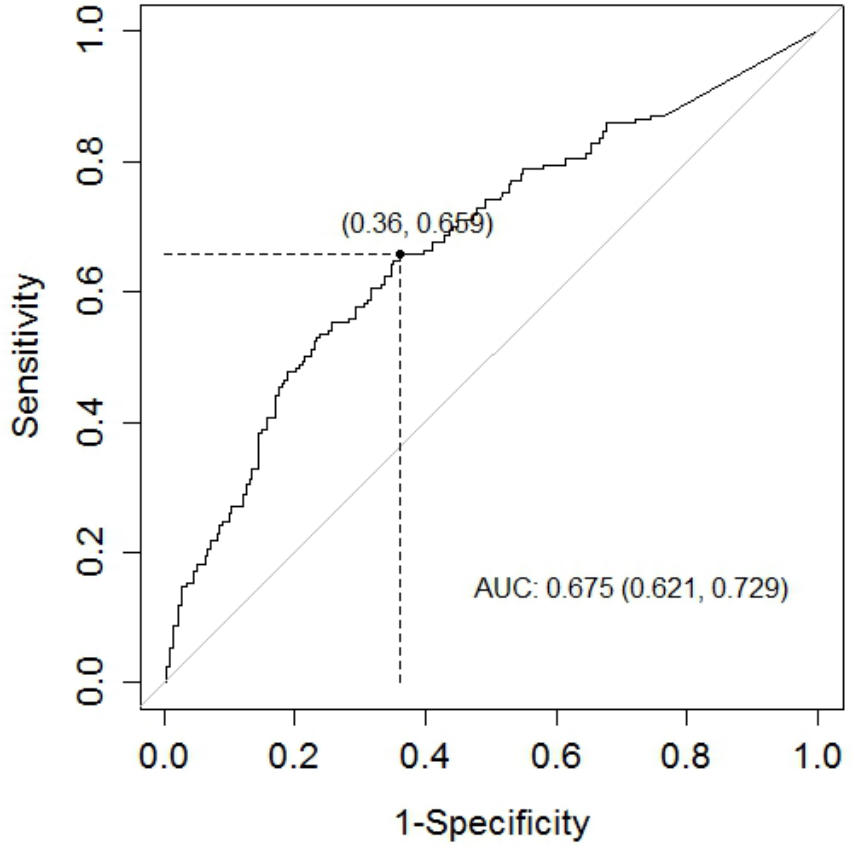
NEWS score - predicting continued ambulatory status at 30 days



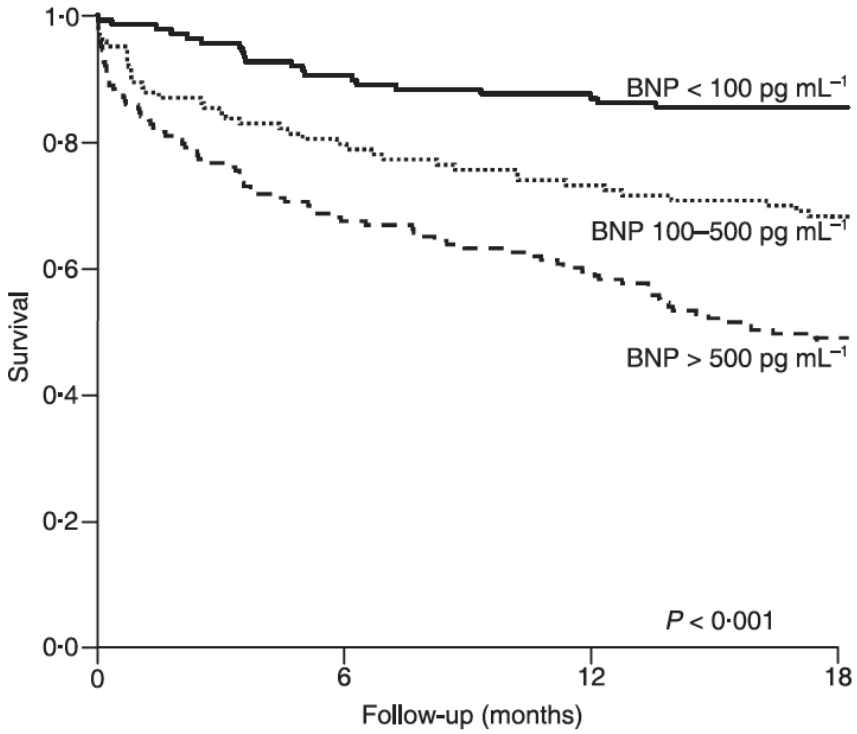
NEWS score + POC blood tests (urea, crp, Hb)

- predicting continued ambulatory status at 30 days





Candidate biomarkers for ambulatory care selection



All presentations to ED with breathlessness

BNP predicts long term mortality irrespective of diagnosis

European Journal of Clinical Investigation (2007) **37**, 834–841

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Delivering new care models – professional perspectives

"I think it does provide a better experience for patients, it's smoother and …. they obviously get their treatment quicker"

"I don't think we could function at all as a unit without it [POC testing]"

"crucial… integral to running this service"

"for our decision making at the time and to provide a plan for that patient and give them the best treatment we need to have that [POC test] result in our hand there and then"

Croxson C, Glogowska M, Locock L, Lasserson D, *under review, BMC Health Services Research*

Delivering new care models

- POC blood tests are critical enablers
  - Release a cascade of change in processes of care
  - High quality decision making in the acute care pathway
  - Rapid diagnosis and rapid rule out
  - Move care closer to home
  - Improve patient flow
  - Patient and carer experience

Delivering new care models - challenges

- POC tests are critical enablers
  - Which blood tests optimise selection for ambulatory care?
  - Acute care in the home / care home
  - Clinician pipeline – new care models and new ways of working
  - POC imaging – acute kidney injury, effusions, doppler…

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