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Using procalcitonin to guide duration of antibiotics

Submission date	Recruitment status	[X] Prospectively registered
06/09/2017	No longer recruiting	[X] Protocol
Registration date	**Overall study status**	[X] Statistical analysis plan
20/09/2017	Completed	[X] Results
Last Edited	**Condition category**	[_] Individual participant data
19/05/2025	Infections and Infestations	

Plain English summary of protocol

Background and study aims
Sepsis is defined as the body's response to infection, which can often be indistinguishable from the response to other insults like burns or surgery. On one hand, giving antibiotics promptly saves lives, but on the other hand, giving antibiotics to people who do not need them leads to overuse of antibiotics and antimicrobial resistance. The Department of Health recommends that antibiotics should be given for as short a course as is safe, to prevent antimicrobial resistance. Most hospitals in the NHS use a blood test called C-Reactive Protein (CRP) to monitor response to infection, but it is not specific for bacterial infection and shows a delayed response to infection. Procalcitonin (PCT) is a blood test which is specific for bacterial infection and responds more quickly than CRP, but is not routinely used in the NHS. Studies done mainly in adults shows that using procalcitonin to guide clinicians may reduce the amount of antibiotics used, reduce hospital stay, and is not associated with adverse effects such as hospital re-admission, incomplete treatment of infections, relapse or death. A recent guideline from the National Institute for Health and Care Excellence (NICE) recommends further research on procalcitonin testing to guide antibiotic use in children. The aim of this study is to compare the current management of severe bacterial infection (SBI) in children (doctors use clinical judgement and may also use CRP to decide on duration of intravenous antibiotics) with procalcitonin-guided management, where the management is identical to current practice, except that doctors have an additional procalcitonin test with advice on how to interpret the result.

Who can participate?
Children up to the age of 18 who are admitted to the hospital for confirmed or suspected bacterial infection.

What does the study involve?
Children hospitalised with suspected or confirmed bacterial infection are randomised to the intervention or control arm. In those randomised to the intervention arm, a Procalcitonin (PCT) test is performed in the hospital laboratory at baseline, days 3-5, days 6-14 and day 28 (if still on IV antibiotics). The PCT results feed into an algorithm that guides antimicrobial prescribing decisions. Children in the control arm do not have the PCT test performed and receive care as usual. Participants are followed up at day 28 with a telephone call or electronic follow up to ask about the quality of life of the children and healthcare utilisation.

What are the possible benefits and risks of participating?
The benefit of taking part is that the information collected will help children/young people in the future. Taking part in the trial will mean giving up some time during the child's hospital stay and at the follow-up telephone call.

Where is the study run from?
This study is being run by the University of Liverpool (UK) and takes place in children's hospitals in the UK.

When is the study starting and how long is it expected to run for?
September 2017 to January 2023

Who is funding the study?
NIHR HTA Programme

Who is the main contact?
Dr Cherry-Ann Waldron

Contact information

Type(s)
Public

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Scientific

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Additional identifiers

EudraCT/CTIS number
Nil known

IRAS number

ClinicalTrials.gov number
Nil known

Secondary identifying numbers
UoL001333

Study information

Scientific Title
Biomarker-guided duration of Antibiotic Treatment in Children Hospitalised with confirmed or suspected bacterial infection

Acronym
BATCH

Study objectives
The aim of this study is to determine if the addition of Procalcitonin (PCT) testing to current best practice based on the NICE Antimicrobial Stewardship (AMS) guidelines can safely allow a reduction in duration of antibiotic therapy in hospitalised children with suspected or confirmed bacterial infection compared to current best practice alone.

Ethics approval required
Old ethics approval format

Ethics approval(s)
North West-Liverpool East REC, 13/04/2018, ref: 18/NW/0100

Study design
Prospective two-armed individually randomized controlled trial (RCT)

Primary study design
Interventional

Secondary study design
Randomised controlled trial

Study setting(s)
Hospital

Study type(s)
Diagnostic

Participant information sheet
Not available in web format, please use the contact details to request a patient information sheet

Health condition(s) or problem(s) studied
Bacterial infection

Interventions
Children hospitalised with suspected or confirmed bacterial infection are randomised to the intervention or control arm. In those randomised to the intervention arm, a Procalcitonin (PCT) test is performed in the hospital laboratory at baseline, days 3-5, days 6-14 and day 28 (if still on IV antibiotics). The PCT results feed into an algorithm that guides antimicrobial prescribing decisions. Children in the control arm do not have the PCT test performed and receive care as usual.

At Day 28, participants receive a telephone or electronic follow up with the parent to ask about the healthcare utilisation and quality of life of the child.

Intervention Type
Other

Primary outcome measure
1. Antibiotics use is measured using the number of days IV antibiotics are used
2. Safety is measured as the number of patients experiencing one of:
2.1. Unscheduled admissions/re-admissions (to include readmission rate within 7 days of discharge with infective diagnosis, unscheduled readmission to PICU with infective diagnosis, or admission to PICU with infective diagnosis)
2.2. Re-treatment for same condition within 7 days of stopping IV antibiotics (re-starting IV antibiotics which have been stopped),
2.3. Mortality

Secondary outcome measures
1. Total duration of antibiotics (IV and oral)
2. Unscheduled admissions/re-admissions (to include readmission rate within 7 days of discharge with infective diagnosis, unscheduled readmission to PICU with infective diagnosis, or admission to PICU with infective diagnosis.)
3. Re-treatment for same condition within 7 days of stopping IV antibiotics (re-starting IV antibiotics which have been stopped)
4. Time to switch from broad spectrum to narrow spectrum antibiotics
5. Time to discharge from hospital
6. Suspected Adverse Drug Reactions (ADR) is measured using the Liverpool Causality Assessment Tool.

7. Cost of hospital episode is measured using cost analysis.
8. Hospital Acquired Infection (HAI) is measured using up to Day 28
9. Health utility is measured using CHU9D (for children aged 5 and above) up to Day 28.
10 Mortality.

Outcome data is recorded daily by the research nurse for all recruited participants (up to and including Day 28, or until discharge). Research nurses review observation and medication charts, medical notes for all recruited participants.

Overall study start date
01/09/2017

Completion date
23/01/2023

Eligibility

Key inclusion criteria
Current inclusion criteria as of 07/11/2019:
1. All children aged between 72 hours old and up to 18 years old admitted to hospital for confirmed or suspected SBI, in whom IV antibiotics are commenced, and expected to remain on IV antibiotics for more than 48 hours
2. Conditions include (but not limited to): bacteraemia, central line-associated bloodstream infections (CLABSIs), uncomplicated bone and joint infections (such as single site infection, osteomyelitis with adjacent septic arthritis or septic arthritis with adjacent osteomyelitis), discitis, empyema, pneumonia, pyelonephritis, sinusitis, retropharyngeal abscess, pyomyositis, uncomplicated culture-negative meningitis, intra-abdominal infections, lymphadenitis, cellulitis
3. First time in the BATCH trial

Previous inclusion criteria from 02/05/2018 to 07/11/2019:
1. All children up to 18 years old admitted to hospital for confirmed or suspected bacterial infection or sepsis, in whom IV antibiotics are commenced, and expected to remain on IV antibiotics for at least 48 hours
2. Conditions include: bacteraemia, bone and joint infections, discitis, empyema, pneumonia, pyelonephritis, sinusitis, retropharyngeal abscess, pyomyositis, uncomplicated culture-negative meningitis, intra-abdominal infections, lymphadenitis, cellulitis, central line-associated bloodstream infections (CLABSIs) and bacterial endocarditis
3. First time in the BATCH trial

Original inclusion criteria:
1. All children up to 18 years old admitted to hospital for confirmed or suspected bacterial infection or sepsis, in whom IV antibiotics are commenced, and expected to remain on IV antibiotics for at least 48 hours
2. Conditions include: bacteraemia, bone and joint infections, discitis, empyema, pneumonia, pyelonephritis, sinusitis, retropharyngeal abscess, pyomyositis, uncomplicated culture-negative meningitis, intra-abdominal infections, lymphadenitis, cellulitis, bacterial endocarditis

Participant type(s)
Patient

Age group

Child

Lower age limit
3 Days

Upper age limit
18 Years

Sex
Both

Target number of participants
1942

Total final enrolment
1951

Key exclusion criteria
Current exclusion criteria as of 07/11/2019:
1. Preterm infant age
2. Children admitted moribund and not expected to survive more than 24 hours
3. Children with a predicted duration of intravenous (IV) antibiotics of less than 48 hours
4. Children not expected to survive at least 28 days because of a pre-existing condition
5. Children with bacterial meningitis, bacterial endocarditis, or brain abscess
6. Children with complicated bone and joint infections
7. Children receiving antibiotics for surgical prophylaxis
8. Children with chronic co-morbidities, such as cystic fibrosis, chronic lung disease, bronchiectasis where there is already a pre-defined length of course of antibiotics
9. Children who are severely immunocompromised (e.g. chemotherapy, stem cell transplant, biological therapy for inflammatory or rheumatological conditions)
10. Children who in the opinion of the local investigator, are unsuitable for randomisation due to high probability of requiring sustained IV therapy
11. Children with a presence of existing directive to withhold life-sustaining treatment
12. Added 01/02/2021: Inborn infants admitted to Neonatal Intensive Care Units (NICU), Neonatal High Dependency Units (NHDU), Special Care Baby Units (SCBU) or Postnatal wards

Previous exclusion criteria:
1. Preterm infant age <37 weeks corrected gestational age or ≥18 years of age
2. Children admitted moribund and not expected to survive more than 24 hours
3. Children with a predicted duration of stay of less than 48 hours
4. Children not expected to survive at least 28 days because of a pre-existing condition
5. Bacterial meningitis, bacterial endocarditis, brain abscess
6. Children receiving antibiotics for surgical prophylaxis
7. Chronic co-morbidities, such as cystic fibrosis, chronic lung disease, bronchiectasis
8. Severe immunocompromised (e.g. chemotherapy, stem cell transplant, biological therapy for inflammatory or rheumatological conditions, TPN dependent)
9. Presence of existing directive to withhold life-sustaining treatment
10. Added 02/05/2018: Children, who in the opinion of the local investigator, are unsuitable for randomisation due to high probability of requiring long term IV therapy

Date of first enrolment

11/06/2018

Date of final enrolment
30/11/2022

Locations

Countries of recruitment
England

United Kingdom

Wales

Study participating centre
Alder Hey Children's NHS Foundation Trust
Eaton Road
Liverpool
United Kingdom
L12 2AP

Study participating centre
Noah's Ark Children's Hospital for Wales
Heath Park Way
Cardiff
United Kingdom
CF14 4XW

Study participating centre
Bristol Royal Hospital for Children
24 Upper Maudlin Street
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United Kingdom
BS2 8BJ

Study participating centre
University Hospital Southampton NHS Foundation Trust
Tremona Road
Southampton
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SO16 6YD

Study participating centre
Sheffield Children's NHS Foundation Trust
Western Bank
Sheffield
United Kingdom
S10 2TH

Study participating centre
Pennine Acute Hosptials NHS Trust
Delaunays Road
Crumpsall
United Kingdom
M8 5RB

Study participating centre
Children’s Hospital, John Radcliffe Hospital
Oxford University Hospitals NHS Foundation Trust
Oxford
United Kingdom
OX3 9DU

Study participating centre
University Hospital Lewisham
Lewisham and Greenwich NHS Trust
London
United Kingdom
SE13 6LH

Study participating centre
Royal Devon and Exeter Hospital
Royal Devon and Exeter NHS Foundation Trust
Exeter
United Kingdom
EX2 5DW

Study participating centre
Poole Hospital
Poole Hospital NHS Trust

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BH15 2JB

Study participating centre
Countess of Chester Hospital
Countess of Chester Hospital NHS Foundation Trust
Chester
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CH2 1UL

Study participating centre
Royal Derby Hospital
University Hospitals Derby and Burton NHS Foundation Trust
Uttoxeter Road
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DE22 3NE

Study participating centre
Queen Alexandra Hospital
Portsmouth Hospitals University NHS Trust
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Organisation
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3 Brownlow Street
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L69 3GL

Sponsor type
University/education

ROR
https://ror.org/04xs57h96

Funder(s)

Funder type
Government

Funder Name
NIHR HTA Programme

Results and Publications

Publication and dissemination plan
The trialists intend to publish the main trial results in international peer-reviewed journals and present at national and international scientific meetings. A protocol paper will be submitted for publication. Additional documentation will be available upon request.

Intention to publish date
28/02/2025

Individual participant data (IPD) sharing plan
The datasets generated during the current study are available upon request from the Centre for Trials Research, Cardiff University by contacting the trial manager at BATCH@cardiff.ac.uk. Pseudo-anonymised data will be provided upon production of the requestor's study protocol and agreement by Centre of Trials Research and study sponsor (University of Liverpool).

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Protocol article		25/01/2022	27/01/2022	Yes	No
Statistical Analysis Plan	SAP article	30/05/2023	31/05/2023	No	No
HRA research summary			28/06/2023	No	No
Results article		08/01/2025	14/01/2025	Yes	No
Results article		01/05/2025	19/05/2025	Yes	No