

Additional healthcare activity trends captured outside data sets

In late 2019, we conducted an informal search of the literature. Our primary aim was to explore the evidence on the use of specialised and primary healthcare services by children and young people in the UK in order to gain a better understanding of healthcare activity outside of that covered in existing national datasets. We ran a search across the Cochrane library and PubMed, looking for studies of children and young people between the ages of zero and 25 years, in the UK only. We were interested in healthcare activity: admissions, episodes, visits and treatment.

We were unable to look at all papers identified. However, members of our working group met to group them into seven domains of paediatric care. Papers identified were then looked at in detail across four of these domains:

- Child and adolescent mental health
- Emergency care
- Primary care
- Maternity and neonatal care

Search Strategy

Health Services Field: Title/Abstract/Keyword
“NHS service” OR “NHS” OR “health facilit\$” “specialised health services” OR “specialist” OR “hospitalisation” OR “emergency health services” OR “mental health services” OR “preventive health services” OR “health check\$ups” OR “primary service” OR “dental care” OR “primary care” OR “neonatal care”
CYP Field: Title/Abstract/Keyword
“child” OR “children” OR “adolescent\$” OR “youth” OR “minor” OR “p\$ediatric” OR “neonatal” OR “young person” OR “young adult” OR “teenage\$”
Healthcare activity Field: Title/Abstract/Keyword
“health\$care activity” OR “episode” OR “visit” OR “treatment” OR “admission” OR “attendance” OR “clinic activity”
UK Field: All text
“UK” OR “U.K.” OR “United Kingdom” OR “England” OR “Wales” OR “Scotland” OR “Northern Ireland”

Child and adolescent mental health

Lead: Dr Arrash Arya Yassaee

Background

Hospital admissions for eating disorders in England rose by 16% from 2011 to 2012 and more than 50% of these were related to adolescent girls, which caused a significant burden on health service budget. Furthermore the duration of hospital stays for anorexia nervosa increased by more than 4 weeks during the past decade in the UK.¹ Between 20 and 40% of bipolar adults have their first onset in childhood or adolescence, and 20% of depressed children eventually develop bipolar disorder.² Studies have also demonstrated that 5–28% of children experience PTSD following acute paediatric critical illness,³ and 30.6% of children with symptoms of psychotic illness experienced some form of child abuse.⁴

Key findings

Admission of young people with mental health problem to Specialist CAMHS units has been shown to be clinically and cost-effective, associated with substantive improvements across a range of diagnoses. Individuals with intellectual disability have been found to have a longer length of stay than those without (109.9 days vs 78.2 days) [Chaplin et al]. Relatedly, another study showed that adolescent outreach is a viable and sustainable alternative to inpatient care for some young people referred for psychiatric admission and reduces the need for acute beds.⁵

In terms of treatment approach, supplementing child-CBT with treatment that targeted maternal cognitions and behaviours has been shown to potentially represent a cost-effective use of resources.⁶ Use of ADHD medication is correlated to the income level of

¹ Herpertz-Dahlmann B, Schwarte R, Krei M, Egberts K, Warnke A, Wewetzer C, Pfeiffer E, Fleischhaker C, Scherag A, Holtkamp K, Hagenah U, Bühren K, Konrad K, Schmidt U, Schade-Brittinger C, Timmesfeld N, Dempfle A. Day-patient treatment after short inpatient care versus continued inpatient treatment in adolescents with anorexia nervosa (ANDI): a multicentre, randomised, open-label, non-inferiority trial. *Lancet*. 2014 Apr 5;383(9924):1222-9. doi: 10.1016/S0140-6736(13)62411-3. Epub 2014 Jan 17. PMID: 24439238.

² Miklowitz DJ, Axelson DA, Birmaher B, et al. Family-Focused Treatment for Adolescents With Bipolar Disorder: Results of a 2-Year Randomized Trial. *Arch Gen Psychiatry*. 2008;65(9):1053-1061. doi:10.1001/archpsyc.65.9.1053

³ Als LC, Nadel S, Cooper M, Vickers B, Garralda ME. A supported psychoeducational intervention to improve family mental health following discharge from paediatric intensive care: feasibility and pilot randomised controlled trial. *BMJ Open*. 2015 Dec 29;5(12):e009581. doi: 10.1136/bmjopen-2015-009581. PMID: 26715482; PMCID: PMC4710808.

⁴ Shah S, Mackinnon A, Galletly C, Carr V, McGrath JJ, Stain HJ, Castle D, Harvey C, Sweeney S, Morgan VA. Prevalence and impact of childhood abuse in people with a psychotic illness. Data from the second Australian National Survey of Psychosis. *Schizophr Res*. 2014 Oct;159(1):20-6. doi: 10.1016/j.schres.2014.07.011. Epub 2014 Aug 5. PMID: 25107848.

⁵ Adrian N, Smith JG. Occupied bed days a redundant currency? An evaluation of the first 10 years of an integrated model of care for mentally ill adolescents. *Clin Child Psychol Psychiatry*. 2015 Jul;20(3):458-71. doi: 10.1177/1359104514527298. Epub 2014 Apr 1. PMID: 24694901.

⁶ Creswell C, Violato M, Fairbanks H, White E, Parkinson M, Abitabile G, Leidi A, Cooper PJ. Clinical outcomes and cost-effectiveness of brief guided parent-delivered cognitive behavioural therapy and solution-focused brief therapy for treatment of childhood anxiety disorders: a randomised controlled trial. *Lancet Psychiatry*. 2017 Jul;4(7):529-539. doi: 10.1016/S2215-0366(17)30149-9. Epub 2017 May 17. PMID: 28527657; PMCID: PMC5483485.

children's families' country of origin.⁷ Providing aftercare in the form of psychoeducational tools can reduced rates of PTSD in parents and young people following acute paediatric critical illness.⁸ A US-based open treatment trial of 20 young people with bipolar disorder found that medications combined with family-focussed psychoeducational treatment resulted in improvements in depression and mania symptoms as well as behaviour problems over 1 year.⁹ Evidence from Australia indicates that service engagement for young people utilising a specialist adolescent drug and alcohol services is at least as effective as conventional adult services, whilst the incidence and prevalence of drug and alcohol use justifies an expert service [at least in Australia] [Phillips et al]

Clinicians managing child development clinics are increasingly in a position to recognise children at higher risk for ASD such as those surviving extreme prematurity or presenting with global developmental delay. Increasingly complex social and psychological presentations mean that diagnostic services require increasingly length assessments¹⁰.

Not every study reported benefits. One study showed that community treatment orders do not provide patient benefits and their continued high level of use should be reviewed.¹¹ Another concluded that web-based preventative intervention programmes for bipolar disorder currently have no evidence of significant effect.¹² In the US a different approach to inpatient management of anorexia nervosa, namely brief inpatient stabilisation and long-term outpatient treatment has been criticised because of increasing readmission rates and insufficient weight gain in outpatient settings.¹³ The CASCADE intervention (clinic-based structured educational group incorporating psychosocial approaches) did not improve clinical outcomes for young people with diabetes. However this is clouded by a low engagement rate, with only 53% of participating in the intervention arm receiving any intervention sessions.¹⁴

⁷ Arat, A., Östberg, V., Burström, B. et al. ADHD medication in offspring of immigrants – does the income level of the country of parental origin matter?. *BMC Psychiatry* 18, 3 (2018). <https://doi.org/10.1186/s12888-017-1572-z>

⁸ Als LC, Nadel S, Cooper M, Vickers B, Garralda ME. A supported psychoeducational intervention to improve family mental health following discharge from paediatric intensive care: feasibility and pilot randomised controlled trial. *BMJ Open*. 2015 Dec 29;5(12):e009581. doi: 10.1136/bmjopen-2015-009581. PMID: 26715482; PMCID: PMC4710808.

⁹ Miklowitz DJ, Axelson DA, Birmaher B, et al. Family-Focused Treatment for Adolescents With Bipolar Disorder: Results of a 2-Year Randomized Trial. *Arch Gen Psychiatry*. 2008;65(9):1053-1061. doi:10.1001/archpsyc.65.9.1053

¹⁰ Hathorn C, Alateeqi N, Graham C, O'Hare A. Impact of adherence to best practice guidelines on the diagnostic and assessment services for autism spectrum disorder. *J Autism Dev Disord*. 2014 Aug;44(8):1859-66. doi: 10.1007/s10803-014-2057-2. PMID: 24573334.

¹¹ Burns T, Yeeles K, Koshariis C, Vazquez-Montes M, Molodynski A, Puntis S, Vergunst F, Forrest A, Mitchell A, Burns K, Rugkåsa J. Effect of increased compulsion on readmission to hospital or disengagement from community services for patients with psychosis: follow-up of a cohort from the OCTET trial. *Lancet Psychiatry*. 2015 Oct;2(10):881-90. doi: 10.1016/S2215-0366(15)00231-X. Epub 2015 Sep 8. PMID: 26362496.

¹² Barnes CW, Hadzi-Pavlovic D, Wilhelm K, Mitchell PB. A web-based preventive intervention program for bipolar disorder: outcome of a 12-months randomized controlled trial. *J Affect Disord*. 2015 Mar 15;174:485-92. doi: 10.1016/j.jad.2014.11.038. Epub 2014 Nov 26. PMID: 25554993.

¹³ Herpertz-Dahlmann B, Schwarte R, Krei M, Egberts K, Warnke A, Wewetzer C, Pfeiffer E, Fleischhaker C, Scherag A, Holtkamp K, Hagenah U, Bühren K, Konrad K, Schmidt U, Schade-Brittinger C, Timmesfeld N, Dempfle A. Day-patient treatment after short inpatient care versus continued inpatient treatment in adolescents with anorexia nervosa (ANDI): a multicentre, randomised, open-label, non-inferiority trial. *Lancet*. 2014 Apr 5;383(9924):1222-9. doi: 10.1016/S0140-6736(13)62411-3. Epub 2014 Jan 17. PMID: 24439238.

¹⁴ Christie D, Thompson R, Sawtell M, Allen E, Cairns J, Smith F, Jamieson E, Hargreaves K, Ingold A, Brooks L, Wiggins M, Oliver S, Jones R, Elbourne D, Santos A, Wong IC, O'Neill S, Strange V,

Forecasting the future

There are positive research findings from RCTs that relate to non-acute services. Intensive community support can help reduce CAMHS inpatient bed days. Such services are sustainable and have operated for over 10 years in the USA. Average length of stay has come down to 36 days from an average of 16.6 weeks in other comparable units.¹⁵ A recent RCT in Germany found that day-patient treatment for anorexia nervosa was non-inferior to inpatient management with regards to initial weight gain and sustained BMI after 12 months.¹⁶ If results from an ongoing RCT on family-focussed psychoeducational treatment for bipolar disorder are positive, then a structured manual-based psychosocial approach will be available for clinicians who treat adolescent bipolar patients in the community.¹⁷

There are also positive conclusions relating to prevention. Specialist adolescent drug and alcohol services may assist in identifying and engaging high-risk and complex young people in developmentally appropriate treatment.¹⁸ A novel intervention that focussed on modifying maternal parenting responses was associated with some benefit to children and mothers with anxiety disorders and is likely to be cost effective.¹⁹

Hindmarsh P, Annan F, Viner R. Structured, intensive education maximising engagement, motivation and long-term change for children and young people with diabetes: a cluster randomised controlled trial with integral process and economic evaluation - the CASCADE study. *Health Technol Assess*. 2014 Mar;18(20):1-202. doi: 10.3310/hta18200. PMID: 24690402; PMCID: PMC4781436.

¹⁵ Adrian N, Smith JG. Occupied bed days a redundant currency? An evaluation of the first 10 years of an integrated model of care for mentally ill adolescents. *Clin Child Psychol Psychiatry*. 2015 Jul;20(3):458-71. doi: 10.1177/1359104514527298. Epub 2014 Apr 1. PMID: 24694901.

¹⁶ Herpertz-Dahlmann B, Schwarte R, Krei M, Egberts K, Warnke A, Wewetzer C, Pfeiffer E, Fleischhaker C, Scherag A, Holtkamp K, Hagenah U, Bühren K, Konrad K, Schmidt U, Schade-Brittinger C, Timmesfeld N, Dempfle A. Day-patient treatment after short inpatient care versus continued inpatient treatment in adolescents with anorexia nervosa (ANDI): a multicentre, randomised, open-label, non-inferiority trial. *Lancet*. 2014 Apr 5;383(9924):1222-9. doi: 10.1016/S0140-6736(13)62411-3. Epub 2014 Jan 17. PMID: 24439238.

¹⁷ Miklowitz DJ, Axelson DA, Birmaher B, et al. Family-Focused Treatment for Adolescents With Bipolar Disorder: Results of a 2-Year Randomized Trial. *Arch Gen Psychiatry*. 2008;65(9):1053-1061. doi:10.1001/archpsyc.65.9.1053

¹⁸ Phillips NL, Milne B, Silsbury C, Zappia P, Zehetner A, Klineberg E, Towns S, Steinbeck K. Addressing adolescent substance use in a paediatric health-care setting. *J Paediatr Child Health*. 2014 Sep;50(9):726-31. doi: 10.1111/jpc.12622. Epub 2014 Jun 18. PMID: 24943123.

¹⁹ Creswell C, Violato M, Fairbanks H, White E, Parkinson M, Abitabile G, Leidi A, Cooper PJ. Clinical outcomes and cost-effectiveness of brief guided parent-delivered cognitive behavioural therapy and solution-focused brief therapy for treatment of childhood anxiety disorders: a randomised controlled trial. *Lancet Psychiatry*. 2017 Jul;4(7):529-539. doi: 10.1016/S2215-0366(17)30149-9. Epub 2017 May 17. PMID: 28527657; PMCID: PMC5483485.

Emergency care

Lead: Dr Grace Li

Background

A Nuffield report in 2017 showed that Children and Young People (CYP) use emergency department (ED) services more than adults; there are 425 ED attendances for every 1,000 children and young person compared with 345 ED attendances for every 1,000 adults aged 25 and over.²⁰

The absolute number of emergency admissions for children and young people increased by 14 per cent (133,960) between 2006/07 and 2015/16, from 990,903 to 1,124,863. Among children aged one to four, the number of emergency admissions increased by 28 per cent and for infants the increase was up to 30 per cent. The number of emergency admissions for 10 to 14-year-olds and 15 to 19-year-olds decreased over the period. These figures compare to a 20 per cent increase in emergency admission for all ages. Therefore infants and young children showed a disproportionate increase in emergency admissions.

The NHS Outcomes Framework has two specific indicators relating to CYP and their use of ED care:

- 2.3ii: unplanned hospitalisation for asthma, diabetes and epilepsy in under 19s – the rate has fallen over the past decade, with fluctuations from 389.1 per 100,000 population in 2006/07 to 311.7 in 2015/16²¹
- 3.2: emergency admissions for children with lower respiratory tract infections – the rate has increased over the past decade, from 303.6 per 100

Our literature review found that most research has been focused on issues related to these two areas, as well as paediatric admissions more broadly. There has also been a steady increase in emergency admissions for infants (children < 1 year of age).

Key Findings

Attendances

One study examined Scottish ED data from 2000-2013.²² In that time same day discharges rose by 186%, with increased attendance for URTI, and attendances rose by 49%. The demographics of the children did not change.

²⁰ NHS Digital, 2017

²¹ NHS Digital, 2017b

²² Al-Mahtot M, Barwise-Munro R, Wilson P, Turner S. Changing characteristics of hospital admissions but not the children admitted—a whole population study between 2000 and 2013. *Eur J Pediatr.* 2018 Mar;177(3):381-388. doi: 10.1007/s00431-017-3064-z. Epub 2017 Dec 19. PMID: 29260375; PMCID: PMC5816774.

Increasing the availability of walk-in centres and minor injuries units might reduce ED attendance rates.²³ . However, this is multifactorial and may be different between adults and children.²⁴

Having a regular General Practitioner and greater parental satisfaction is associated with fewer admissions to ED for pneumonia.²⁵ Better access to GP appointments is associated with decreased attendance at ED but not rates of subsequent short stay hospitalisation.²⁶ Parental engagement with preventative primary care is inversely related with risk of attending ED.²⁷

Primary care reforms of 2004 were associated with increased rates of short stay admissions for chronic conditions but not infectious illnesses.²⁸ Clinical prediction scores for children presenting to ED with the potential to have a serious infection have shown good negative predictive value.²⁹

Infant attendances

HES were used to examine infant admission patterns in the UK between 2008-2014. Admission of infants has increased by 39% for three conditions seen primarily dealt with by postnatal care (jaundice, feeding difficulties and gastroenteritis).³⁰ This suggests targeted improvements in postnatal care could be effective at reducing admissions in this age group.

²³ Tammes P, Morris RW, Brangan E, Checkland K, England H, Huntley A, Lasserson D, MacKichan F, Salisbury C, Wye L, Purdy S. Exploring the relationship between general practice characteristics and attendance at Walk-in Centres, Minor Injuries Units and Emergency Departments in England 2009/10-2012/2013: a longitudinal study. *BMC Health Serv Res*. 2017 Aug 8;17(1):546. doi: 10.1186/s12913-017-2483-x. PMID: 28789652; PMCID: PMC5549356.

²⁴ Poku BA, Hemingway P. Reducing repeat paediatric emergency department attendance for non-urgent care: a systematic review of the effectiveness of interventions. *Emerg Med J*. 2019 Jul;36(7):435-442. doi: 10.1136/emered-2018-207536. Epub 2019 Jun 21. PMID: 31227526.

²⁵ Emery DP, Milne T, Gilchrist CA, Gibbons MJ, Robinson E, Coster GD, Forrest CB, Harnden A, Mant D, Grant CC. The impact of primary care on emergency department presentation and hospital admission with pneumonia: a case-control study of preschool-aged children. *NPJ Prim Care Respir Med*. 2015 Feb 5;25:14113. doi: 10.1038/npjpcrm.2014.113. PMID: 25654661; PMCID: PMC4498163.

²⁶ Cecil E, Bottle A, Cowling TE, Majeed A, Wolfe I, Saxena S. Primary Care Access, Emergency Department Visits, and Unplanned Short Hospitalizations in the UK. *Pediatrics*. 2016 Feb;137(2):e20151492. doi: 10.1542/peds.2015-1492. Epub 2016 Jan 20. PMID: 26791971.

²⁷ Cecil, E., Bottle, A., Ma, R. et al. Impact of preventive primary care on children's unplanned hospital admissions: a population-based birth cohort study of UK children 2000-2013. *BMC Med* 16, 151 (2018). <https://doi.org/10.1186/s12916-018-1142-3>

²⁸ Cecil E, Bottle A, Cowling TE, Majeed A, Wolfe I, Saxena S. Primary Care Access, Emergency Department Visits, and Unplanned Short Hospitalizations in the UK. *Pediatrics*. 2016 Feb;137(2):e20151492. doi: 10.1542/peds.2015-1492. Epub 2016 Jan 20. PMID: 26791971.

²⁹ Verbakel JY, Lemiengre MB, De Burghgraeve T, De Sutter A, Aertgeerts B, Bullens DM, Shinkins B, Van den Bruel A, Buntinx F. Validating a decision tree for serious infection: diagnostic accuracy in acutely ill children in ambulatory care. *BMJ Open*. 2015 Aug 7;5(8):e008657. doi: 10.1136/bmjopen-2015-008657. PMID: 26254472; PMCID: PMC4538259.

³⁰ Jones E, Taylor B, Rudge G, MacArthur C, Jyothish D, Simkiss D, Cummins C. Hospitalisation after birth of infants: cross sectional analysis of potentially avoidable admissions across England using hospital episode statistics. *BMC Pediatr*. 2018 Dec 20;18(1):390. doi: 10.1186/s12887-018-1360-z. PMID: 30572847; PMCID: PMC6302406.

Respiratory presentations

Bronchiolitis affects mostly under-5-year olds. RSV burden exceeds that of influenza in children and contributed to more than 29,000 hospitalisations.³¹ There is inconsistent use of bronchiolitis guidelines – only 18% of Trusts are compliant with the NICE guideline for the management of acute bronchiolitis.³²

There are concerning trends for the future. A systematic review looked at the effect of air pollutants on admission to hospital with bronchiolitis and concluded that long-term exposure to PM 2.5 may be associated with increased risk of hospitalisation with bronchiolitis.³³

Socioeconomic factors

Presentation to ED with injuries including poisoning and burns correlate with socioeconomic deprivation.³⁴

Forecasting the future

Integrating Primary Care and Paediatrics will be key to the future of Paediatric services, and it has been shown that regular access to a familiar GP is correlated with reduced ED presentations.

Integrated Care pathways such as the Paediatric Primary Care Hub (CC4C) model piloted in North West London, and now introduced to Northern Ireland, will be increasingly common. These will require improved data collection including collaboration with local authorities and Community Paediatric teams, Multi Disciplinary Team working and flexible models of care to suit local healthcare needs and resource allocation.

³¹ Fleming DM, Taylor RJ, Lustig RL, et al. Modelling estimates of the burden of Respiratory Syncytial virus infection in adults and the elderly in the United Kingdom. *BMC Infect Dis.* 2015;15:443. Published 2015 Oct 23. doi:10.1186/s12879-015-1218-z

³² Carande EJ, Galiza EP, Nickless A, Pollard AJ, Drysdale SB. Viral bronchiolitis management in hospitals in the UK. *J Clin Virol.* 2018 Jul;104:29-33. doi: 10.1016/j.jcv.2018.04.010. Epub 2018 Apr 18. PMID: 29704736.

³³ King C, Kirkham J, Hawcutt D, Sinha I. The effect of outdoor air pollution on the risk of hospitalisation for bronchiolitis in infants: a systematic review. *PeerJ.* 2018;6:e5352. Published 2018 Aug 28. doi:10.7717/peerj.5352

³⁴ Baker R, Orton E, Tata LJ, Kendrick D. Epidemiology of poisonings, fractures and burns among 0-24 year olds in England using linked health and mortality data. *Eur J Public Health.* 2016 Dec;26(6):940-946. doi: 10.1093/eurpub/ckw064. Epub 2016 May 31. PMID: 27247115; PMCID: PMC5885973.

Primary care

Lead: Dr Nathan Collicott

Background

The majority of child health problems are managed within primary care. In a typical year, a preschool child will see their GP 6 times and a school-aged child 2-3 times. This is thought to account for around a quarter of the workload of a GP.³⁵

A recent study utilising Clinical Practice Research Datalink (CPRD) aimed to evaluate trends in clinical workload within primary care between 2007 and 2014.³⁶ This included 398 practices across England. Over the time period of the study, there was an increase in consultation rates and total numbers of days contact for children aged 0-4 years and 5-14 years. Accompanied by corresponding increases in demand in other age groups, this outstrips any growth in the provision of primary care practitioners.

In a similar pattern, use of unplanned healthcare services by children and young people, including ED attendance and inpatient admission, has increased substantially over the last decade. However, there is a great degree of variation in rates of attendances and admission across the UK within this overall increase. It is hoped that a proportion of ED attendances may be better dealt with by alternative services such as GP and pharmacists but this is dependent on primary care capacity.

Key Findings

As noted above, utilisation of primary care resources by children and young people continues to increase, as does unplanned use of secondary care services. If primary care is to play a key role in reducing demand on hospital services, extra primary care capacity, either by reducing utilisation or increasing provision, is likely to be required.

Preventive care

In the UK, there is a universal programme of preventive care, including developmental checks and a vaccination schedule. A UK based cohort study evaluated the relationship between uptake of these preventive primary care services and unplanned admissions.³⁷ Lack of preventive care was associated with a higher risk for unplanned admission; preschool children with incomplete vaccination were almost twice as likely to have unplanned admission, while infants who had no developmental checks were four times as likely to have unplanned admission. These associations persisted across childhood. In

³⁵ RCPCH Facing the Future

³⁶ Hobbs FDR, Bankhead C, Mukhtar T, Stevens S, Perera-Salazar R, Holt T, Salisbury C; National Institute for Health Research School for Primary Care Research. Clinical workload in UK primary care: a retrospective analysis of 100 million consultations in England, 2007-14. *Lancet*. 2016 Jun 4;387(10035):2323-2330. doi: 10.1016/S0140-6736(16)00620-6. Epub 2016 Apr 5. Erratum in: *Lancet*. 2016 Jun 4;387(10035):2292. PMID: 27059888; PMCID: PMC4899422.

³⁷ Cecil, E., Bottle, A., Ma, R. et al. Impact of preventive primary care on children's unplanned hospital admissions: a population-based birth cohort study of UK children 2000-2013. *BMC Med* 16, 151 (2018). <https://doi.org/10.1186/s12916-018-1142-3>

addition, infants within the most deprived quintile were 22% more likely to have unplanned admission and this increase double to 44% in primary school aged children.

Other studies have looked at alternative methods of reducing demand for primary care services. For example, it is known that exacerbations of asthma in school-age children peak with return to school in September, associated with a fall in the collection of prescriptions for inhaled corticosteroids (ICS). One study assessed the impact of a letter sent out by GPs with a reminder to maintain prescribed medication on unplanned medical contacts.³⁸ The intervention increased the proportion of children collection a prescription for ICS, reduced the total number of contacts by 5% over the follow up year and was estimated to save £36 per patient. Furthermore, education within other environments may have a role to play. A systematic review evaluating the efficacy of school-based interventions to improve self-management skills in asthma care suggests that such interventions reduce unplanned attendance at GP and ED, as well as admissions, though by small amounts.³⁹

Access

As discussed previously, demand for unplanned paediatric hospital services is consistently rising. It is hypothesised that GP access is a factor in driving increased attendances. In one study, using CPRD and HES data, GP practices were ranked for their accessibility, based on national GP patient survey data. Children registered with practices with the best access were 9% less likely to attend ED.⁴⁰ Similarly, characteristics of practices associated with lower rate of self-referred attendance at ED, Minor Injuries Units and Walk in Centres include practices with a higher patient satisfaction for waiting time and higher percentage of patients able to see a preferred GP.⁴¹

Alternative models

Across Europe, there is variation in the organisation of paediatric primary care services. This can be broadly split into systems of primary care that are paediatrician-based or GP-based. One study has compared attendances attendance at Addenbrooke's PED with

³⁸ Julious SA, Horspool MJ, Davis S, et al

Open-label, cluster randomised controlled trial and economic evaluation of a brief letter from a GP on unscheduled medical contacts associated with the start of the school year: the PLEASANT trial *BMJ Open* 2018;8:e017367. doi: 10.1136/bmjopen-2017-017367

³⁹ Harris K, Kneale D, Lasserson TJ, McDonald VM, Grigg J, Thomas J. School-based self-management interventions for asthma in children and adolescents: a mixed methods systematic review. *Cochrane Database Syst Rev*. 2019 Jan 28;1(1):CD011651. doi: 10.1002/14651858.CD011651.pub2. PMID: 30687940; PMCID: PMC6353176.

⁴⁰ Tammes P, Morris RW, Brangan E, Checkland K, England H, Huntley A, Lasserson D, MacKichan F, Salisbury C, Wye L, Purdy S. Exploring the relationship between general practice characteristics and attendance at Walk-in Centres, Minor Injuries Units and Emergency Departments in England 2009/10-2012/2013: a longitudinal study. *BMC Health Serv Res*. 2017 Aug 8;17(1):546. doi: 10.1186/s12913-017-2483-x. PMID: 28789652; PMCID: PMC5549356.

⁴¹ Tammes P, Morris RW, Brangan E, Checkland K, England H, Huntley A, Lasserson D, MacKichan F, Salisbury C, Wye L, Purdy S. Exploring the relationship between general practice characteristics and attendance at Walk-in Centres, Minor Injuries Units and Emergency Departments in England 2009/10-2012/2013: a longitudinal study. *BMC Health Serv Res*. 2017 Aug 8;17(1):546. doi: 10.1186/s12913-017-2483-x. PMID: 28789652; PMCID: PMC5549356.

those at Trieste in Italy, where paediatric primary care is delivered by paediatricians.⁴² The key findings of this study are that ED attendances, especially among infants, are more common in a primary care setting provided by general practitioners but also that admission rates in all age groups are higher (14.1% vs 4.8%). Furthermore, the ED discharge diagnosis of ‘well child’ is much more frequently made.

One new potential model is that of the ‘Child Health GP Hub’. This model involves a hub of 3-4 practices with monthly joint GP/paediatrician clinics, ready access to paediatricians for advice and MDT discussion of cases for shared learning. The evaluation of the pilot of this project suggests reductions in new hospital general and specialty paediatric outpatient appointments, ED attendances and admissions.⁴³

Forecasting the future

If current trends continue, it seems unlikely that primary care will have the capacity and resources available to reduce or slow the increased demand for secondary care services. Provision of preventive healthcare services have been linked with reduced utilisation of both primary and secondary care services and it is possible that greater investment in these strategies would provide additional benefit. For example, approximately 2000 unplanned admissions in England would be avoided if all preschool children had the same admission rate of those who were fully immunised.⁴⁴ In addition, common infectious agents such as RSV and norovirus provide a significant burden to GP practice; successful efforts in developing vaccinations would clearly have a significant impact on attendances with illness caused by these organisms.

Finally, alternative models of care may offer some hope for the future. An early pilot of greater paediatric involvement in primary care has suggested a positive impact. If this benefit is replicated and scaled up, this could potentially improve the quality of care provided to children and young people and reduce the need for hospital services.

⁴² Poropat F, Heinz P, Barbi E, Ventura A. Comparison of two European paediatric emergency departments: does primary care organisation influence emergency attendance? *Ital J Pediatr*. 2017 Mar 8;43(1):29. doi: 10.1186/s13052-017-0339-y. PMID: 28274237; PMCID: PMC5341451.

⁴³ Montgomery-Taylor S, Watson M, Klaber R. Child Health General Practice Hubs: a service evaluation. *Arch Dis Child*. 2016 Apr;101(4):333-7. doi: 10.1136/archdischild-2015-308910. Epub 2015 Dec 23. PMID: 26699536.

⁴⁴ Cecil, E., Bottle, A., Ma, R. et al. Impact of preventive primary care on children’s unplanned hospital admissions: a population-based birth cohort study of UK children 2000–2013. *BMC Med* 16, 151 (2018). <https://doi.org/10.1186/s12916-018-1142-3>

Maternity and neonatal care

Lead: Dr Rosaline Garr

Background

The health of the newborn infant is linked to the health of the mother, and support services after birth have an impact on readmission rates.

Key Findings

Preterm rupture of membranes and consequences including preterm birth, infection and foetal demise as well as mode of management of the expectant mother are unresolved problems. Management of these at risk mothers at home versus hospital have been explored^{45,46} as well as improving the antenatal experience by having group sessions in contrast to the conventional care.⁴⁷ Optimising the outcome for infants who are born preterm with antenatal steroids has become standard care the beneficial effects on the maturity of the lungs not lasting beyond seven days. Repeat doses are not without difficulties like impact on foetal growth.⁴⁸ Increasing number of expectant mothers have underlying health conditions like diabetes mellitus with new treatments like continuous glucose monitoring improving outcomes.⁴⁹ Obesity, maternal smoking and psychiatric illnesses are still ongoing challenges.^{50,51,52}

Prevention of hypothermia a predictor of morbidity and mortality is still a challenge especially in the preterm infant. A Cochrane review found plastic bags or wraps prevented hypothermia though there was more hyperthermia.⁵³ Bronchopulmonary dysplasia (BPD) a chronic respiratory condition associated with prematurity has proved difficult to prevent, the Cochrane reviews on the use of early corticosteroids found hydrocortisone of benefit but not dexamethasone and there were concerns about cerebral palsy in the longer term.

⁴⁵ Abou El Senoun G, Dowswell T, Mousa HA.(2014) Planned home versus hospital care for preterm prelabour of the membranes (PPROM) prior to 37weeks' gestation. Cochrane database of systematic review ,Issue4

⁴⁶ Chloe Dussaux, Marie-Victoire Senat, Henane Bouchghoul et al (2018) Preterm premature rupture of membranes: is home care acceptable?, The Journal of Maternal-Fetal & Neonatal Medicine, 31:17, 2284-2292.

⁴⁷ Catling C J, Medley N, Foureur M et al (2015) Group versus conventional antenatal care for women. Cochrane database of systematic reviews ,Issue2.

⁴⁸ Crowther CA, Mckinlay CJD, Middleton P et al (2015) Repeat doses of prenatal corticosteroids for women at risk of preterm birth for improving neonatal health outcomes (2015) Cochrane database of systematic reviews ,Issue7.

⁴⁹ Denise S Feig, Lois E Donovan, Rosa Corcoy (2017) Continuous glucose monitoring in pregnant women with type 1 diabetes (CONCEPTT): a multicentre international randomised controlled trial.www.thelancet.com vol 390.2347-2359

⁵⁰ Carolyn Chiswick, Rebecca Reynolds, Fiona Dennison et al (2015) Effect of Metformin on maternal and fetal Outcomes in obese pregnant women (EMPOWAR): a randomises, double- blind, placebo-controlled trial.www.thelancet.com/diabetes-endocrinology vol 3. 778-86

⁵¹ Lawder R, Whyte B, wood R et al Impact of smoking on early childhood:a retrospective cohort linked dataset analysis of 697 003 children born in Scotland 1997-2009 BMJ open 2019;9

⁵² Martin JL, Mclean G, Martin D et al Admission to psychiatric hospital for mental illnesses 2 years prechildbirth and postchildbirth in Scotland: a health informatics approach to assessing mother and child outcomes. BMJ Open2017;7

⁵³ McCall EM, Alderdice F, Halliday HL et al Interventions to prevent hypothermia at birth in preterm and/or low birth weight infants. Cochrane database of systematic reviews 2018, Issue2.

The late use of corticosteroids more than seven days was beneficial for aiding extubation.^{54, 55} A suggestion of a link between BPD and retinopathy of prematurity has also been noted.⁵⁶ Patent ductus arteriosus (PDA) treatment with paracetamol appeared as good as Ibuprofen but there are concerns about long term effects of autism.⁵⁷ Therapeutic hypothermia is used for neuroprotection in the near term or term infant with hypoxic-ischaemic encephalopathy, Xenon was thought to further improve outcomes but the Cochrane review found inadequate evidence.⁵⁸

The important role breast milk plays in the in maintaining health of the infant was re-enforced in a Cochrane review of hydrolysed infant formulas for the prevention of allergic disease where exclusive breast feeding was superior.⁵⁹ The care of the mid & late preterm infants 32-36 weeks gestation was found not to be fully costed as some infants were cared for on the postnatal ward. Emergency admissions for children were found to have increased substantially and most of these admissions were for infants. A study of admissions in newborns that required surgery also noted an increase in newborns requiring specialist care with cost implications. Scheduled postnatal visits were found to increase parental satisfaction and reduce the need for newborns to be reviewed by emergency care services. New but expensive treatments are continually in development for the newborn infant.

Forecasting the future

Future trends suggest increasing need of neonatal services, parents would have to be trained up so they become the primary carers for their own infant as this will enable bonding, improve confidence, breastfeeding and early discharge home. This is the ethos of family integrated care. There is an increase in mental health disorders and of mothers being on prescribed medication which can lead to neonatal abstinence syndrome, this is also a problem for infants of mothers on street drugs.

⁵⁴ Doyle LW, Cheong JL, Ehrenkranz et al late (>7 days) systemic postnatal corticosteroids for prevention of bronchopulmonary dysplasia in preterm infants. Cochrane database of systematic reviews 2017, Issue 10.

⁵⁵ Doyle LW, Cheong JL, Ehrenkranz et al Early (~8 days) systemic postnatal corticosteroids for prevention of bronchopulmonary dysplasia in preterm infants. Cochrane database of systematic reviews 2017, Issue 10.

⁵⁶ Freitas MA, Morschbacher R, Thorell MR et al Incidence and risk factors for retinopathy of prematurity: a retrospective cohort study. *Int J Retin Vitro* (2018) 4:20

⁵⁷ Ohlsson A, Shah PS. Paracetamol (acetaminophen) for patent ductus arteriosus in preterm or low weight infants. Cochrane database of systematic reviews 2018, Issue 4.

⁵⁸ Ruegger GM, Davis PG, Cheong JL Xenon as an adjuvant to therapeutic hypothermia in near-term and term newborns with hypoxic-ischaemic encephalopathy. Cochrane database of systematic reviews 2018, Issue 8.

⁵⁹ Osborn DA, Sinn JKH, Jones LJ. Infant formulas containing hydrolysed protein for prevention of allergic disease. Cochrane database of systematic reviews 2018, Issue 10.