

**Audit of Cardiac Rhythm Management
Devices Pacemaker, ICD and CRT**

**Devon, Cornwall and Isles of Scilly
Local Area Team**

2012

Acknowledgments



is a partnership of clinicians, IT experts, statisticians, academics and managers which manages six cardiovascular clinical audits and three clinical registers. NICOR analyses and disseminates information about clinical practice in order to drive up the quality of care and outcomes for patients.



The British Cardiovascular Society promotes education, training and research in cardiovascular health and upholds clinical and professional standards.



British Heart Rhythm Society

The British Heart Rhythm Society (formerly Heart Rhythm UK) is an affiliated group of the British Cardiovascular Society and the Arrhythmia Alliance, and is dedicated to improving all aspects of cardiac arrhythmia care and electrical device based therapies. It provides an essential link between professionals working within pacing, devices and electrophysiology in the UK.



Healthcare Quality Improvement Partnership

The Healthcare Quality Improvement Partnership (HQIP) is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices. Its aim is to promote quality improvement, and in particular to increase the impact of clinical audit in England and Wales. HQIP hosts the contract to manage and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP). The programme comprises 40 clinical audits that cover care provided to people with a wide range of medical, surgical and mental health conditions.



Founded in 1826, UCL (University College London) was the first English university established after Oxford and Cambridge, the first to admit students regardless of race, class, religion or gender, and the first to provide systematic teaching of law, architecture and medicine. It is among the world's top universities, as reflected by performance in a range of international rankings and tables.



Market research in medical device

IHMT is a consulting firm in France that specializes in medical market intelligence and strategic assessment. They provide the geographic mapping services for this report.

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The National Cardiac Rhythm Management Audit of Devices is managed by the National Institute for Cardiovascular Outcomes Research (NICOR), which is part of the National Centre for Cardiovascular Prevention and Outcomes, based at University College London. Specialist clinical knowledge and leadership is provided by the British Cardiovascular Society and British Heart Rhythm Society. The strategic direction and development of the audit is determined by the audit steering committee. This includes major stakeholders in the audit, including cardiologists, the professional societies, physiologists, commissioners and patient group representatives.

We would especially like to thank the contribution of all NHS Trusts and the individual physiologists, clinicians and audit teams who collect data and participate in the audit. Without this input the audit could not continue to produce credible analysis, or to effectively monitor and assess the standard of care in England and Wales.

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National Audit of Cardiac Rhythm Management Devices

CRM Audit Reports up to 2011 have analysed data related to Primary Care Trusts (PCTs) and Cardiac Networks. From 2012, as set out in the Health and Social Care Act 2012, data are analysed on the basis of Clinical Commissioning Groups (CCGs) and Local Area Teams (LATs).

CCGs are groups of General Practitioner (GP) Practices that are responsible for commissioning most health and care services for patients within their local communities. As at the end of March 2013 there were 211 CCGs. They replace PCTs and are overseen by NHS England, including its regional offices and LATs.

There are 25 LATs which are the 'local offices' of the NHS Commissioning Board. All LATs have the same core functions relating to CCG development and assurance, quality and safety and system oversight, amongst other tasks. Ten of the LATs lead on specialised commissioning across England.

The current National CRM Device report analyses data in relation to CCGs and LATs. Since these are not geographically equivalent to the previous administrative structure, their demographics will also differ. It is therefore not valid to make direct comparisons with the PCT and Cardiac Network data from previous reports.

To obviate this problem, and thus restore the comparability which is essential for assessing serial performance, the data for 2010 and 2011 have been re-analysed according to the new boundaries for the purposes of the 2012 Report.

January to December 2012

This 8th annual report of the National CRM Audit describes cardiac device implantation performance in each Local Area Team in England and Wales for 2012. The report places local performance within a national and international context. It compares UK rates with other European countries. The report provides information on implantation rates within the UK and between Local Area Teams of England and Wales. For each Local Area Team of England and Wales this report will:

Identify the CCGs (Local Health Boards in Wales) within the Teams and the principal hospitals implanting cardiac devices within them; summarise the age and sex structure of the CCGs allowing calculation of the relative need for device treatment locally; correct the actual device implant rate within the CCG for its relative need, allowing a valid direct comparison of implant rates between CCGs and LATs for the three years 2010 – 2012, illustrated for each CCG by performance tables and colour coded maps; show local performance for 2010 – 2012 compared to both current national average and national target implant rates; summarise the survey conclusions for each Local Area Team.

The report is aimed at clinicians, healthcare managers, clinical governance leads, commissioners and all those interested in improving the provision and quality of device and arrhythmia services in the UK.

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National Report: Foreword from National Clinical Director

I am pleased to welcome publication of this, the 8th UK Cardiac Rhythm Management (CRM) Device Audit Report, covering the use of cardiac pacemakers, implantable defibrillators (ICDs) and cardiac resynchronisation therapy (CRT) in the calendar year 2012.

I am delighted to see the continued progress of this project. The core audit group has worked closely with the Council of the British Heart Rhythm Society (BHRS), to incorporate key clinical descriptors, which allow correlation of guideline compliance with clinical outcomes. This is now a full clinical audit, led by the relevant national specialist society, and comparable to those published by other specialist groups affiliated to the British Cardiovascular Society. An additional report on cardiac arrhythmia ablation is expected in Spring 2014.

A national clinical audit requires dedicated input from a wide range of skilled professionals. Dr. David Cunningham and his staff and colleagues at NICOR have provided funding stability, together with expertise in data collation and analysis. But complete and accurate data requires the continued efforts of clinical physiologists, nurses and clinicians at the device centres. Their time is often unfunded, yet freely given, and all concerned deserve our recognition and thanks.

The results for 2012 offer real encouragement. Implant rates for both pacemakers and CRT have risen substantially; for ICDs the implant rate is probably stable, the apparent fall being partly artefactual, as explained in the report. However, as in previous years, optimism must be tempered by the fact that UK device implant rates remain significantly below those of comparable European countries, and it appears that inequity of device provision continues. For England, the Health and Social Care Act (2012) resulted in national specialised commissioning of devices being the responsibility of NHS England. This more centralised process offers an opportunity to reduce both inequity of access and unmet need, and future audits will allow us to monitor progress towards these important objectives.

This national CRM device audit continues to provide an essential tool for understanding current practice, and how we should best plan for future improvement. As before, I warmly commend it to all who commission and deliver cardiac device therapy for our patients.

Professor Huon Gray
National Clinical Director for Cardiac Care
NHS England



National Report: Foreword from President of British Heart Rhythm Society

It is a great pleasure to contribute a foreword to the 2012 National Cardiac Rhythm Management (CRM) Device report. Since its inception, and throughout its 10 year evolution, the UK CRM audit project has naturally enjoyed the explicit support of our national society through its own evolution from the British Pacing and Electrophysiology Group (BPEG), through Heart Rhythm UK to its current, and hopefully settled, name. However, the past two years have seen increasingly active collaboration of the Society with the core audit group, and I pay tribute to the sterling efforts of Francis Murgatroyd and Nick Linker in driving the major developments in the CRM device and ablation database content described in their contribution to this 2012 Report.

In 2010 my predecessor, Edward Rowland, alluded to the precarious state of funding for the CRM audits. I am pleased to say that with the welcome transfer of the audits to the care of NICOR, their funding is secure until April 2016, covering an important period of database development and clinical outcomes content for the audits. For their support in this we thank Huon Gray, National Director for Heart Disease, and both John Deanfield and Julie Sanders, the Director and Chief Operating Officer respectively, of NICOR. As ever, thanks must go to David Cunningham and his staff at NICOR who have worked tirelessly to collect, collate and analyse the raw data, and the clinical physiologists, clinicians and managers who provide our device services for their indispensable efforts which underpin the whole CRM audits.

A central task of the CRM device audit has always been, and will remain, a description of the total implant volume and equity of access to the three main implantable cardiac device types – pacemakers (PM) for bradycardia, the implantable cardioverter defibrillator (ICD), and cardiac resynchronisation therapy (CRT) devices for advanced heart failure. My colleagues' sections and the body of the Report itself will record that in 2012 we saw a resumption of the annual increase in new PM implant rates after an unwelcome plateau, a striking increase in CRT implants, but an apparent reduction in ICD rates. The implications of the headline figures are discussed in the Report, but we must remain aware that the NHS continues to perform poorly in the provision of device services compared to our neighbouring health economies in Western Europe, and inequity of provision remains as striking as ever. This audit uniquely describes what we have done, but must increasingly be deployed as a weapon to drive future improvement.

Readers of previous reports will notice the absence this year of a section on arrhythmia ablation. I am pleased to say that the reason for this is entirely positive. The quantity, quality and scope of data describing ablation practice in the UK have improved to a degree that warrant a separate report, and its publication is scheduled for Spring 2014. For this reason, the current report has reverted to the title "Cardiac Rhythm Device Management".

Finally, the CRM Device National Audit Report provides a central core of clinical audit that I am certain will remain of value to all those involved in commissioning, planning and delivering device therapy for cardiac arrhythmias and heart failure. I am also confident that it will stimulate contributions that can lead to further improvements in the quality and equity of care for all our patients in the UK.

Dr. Stephen Furniss
President, British Heart Rhythm Society.



National Report: The future of the UK Cardiac Rhythm Management Audits

Congratulations and thanks are again due to David Cunningham, Morag Cunningham, Dick Charles and Adél de Lange, for another highly detailed report on cardiac device activity in the UK. This is the eighth year of these reports, which have provided vital information on the provision of pacemakers, defibrillators, and cardiac synchronisation therapy across the country. From the start, they have highlighted the UK's poor performance compared with national targets and our EU neighbours, and great regional differences in provision of these vital treatments.

The bar is rising, however, among the other national cardiac audits, as are the expectations of government and the public. The "BPEG database" was the first in the world, but its structure is ageing and suffers from two problems. Firstly, it struggles to reflect the complexity of modern device practice. Secondly, outcome data has received insufficient priority, and this is no longer acceptable. Outcome data (both complications and benefits) are critical in driving high standards, and in demonstrating that our costly "one-off" treatments offer genuine value for money. The ablation database, though younger, suffers from some of the same issues.

The national audits undertaken by BHRS and NICOR need to provide more details of the interventions undertaken by device and electrophysiology specialists, and the outcomes of these interventions. If we do not do this, then others will try, possibly using less accurate, careful, and fair methods.

How can we address these issues? We have undertaken a one-year review process, involving a wide panel of specialist physicians and allied professionals, with representation from government agencies (e.g. NICE, MHRA, NHS Improvement), NICOR, and patients. This resulted in two completely revised datasets, and a consultation period over the summer of 2013 drew invaluable feedback from around 50 centres. The datasets were locked in September and are available on the BHRS website. This gives centres and IT providers almost six months to prepare - the new datasets will be mandatory from 1 April 2014.

The device dataset has been redesigned from top to bottom, and now permits detail of all cardiac implantable electronic device procedures (at least all that we could think of), including those done by surgeons, leadless pacemakers, implantable monitors, and lead extraction. The ablation dataset has been widened to include invasive EP studies, as well as new mapping and ablation technologies. A section has been added asking a little more detail for patients undergoing AF ablation procedures. Overall, the number of questions is not significantly increased; they are different, however, and will require care in completion.

For both datasets, we are asking for the GMC number of operators as well as the consultant responsible. This is in line with the other specialist databases and it is *essential* that this is accurately and completely recorded to avoid errors or duplication.

We have tried to select clinically relevant outcomes. The new dataset should be able to monitor adherence to implant guidelines, and record important complications of device implants. Importantly, centres will be required to track these for the first year of follow-up, *even if patients' care is transferred elsewhere*. For catheter ablation we will be looking at acute success, and complications occurring up to three months post procedure. For AF ablation in particular we will be rolling out a programme of recording Patient Reported Outcome Measures (quality of life questionnaires) before and one year post procedure.

Hitherto, only a minority of the datasets have been used or published. As a result, complete data submission has been patchy, and some important parts of the data unreliable. This is particularly the case for complication reporting, which has been very patchy. Many centres (including some of the largest) have reported no complications over years. This is simply not credible, and we are exploring ways of "policing" complication reporting, including the use of re-interventions and HES data. In the future, a track record of complete reporting of complications will be an essential part of the forthcoming centre accreditation process.

The next (2013) annual device and ablation reports will therefore be the last to be derived from the current dataset. Thereafter, reports will be by financial year, in line with most other national audits. We anticipate starting to report activity by centre and consultant in 2015, and outcomes for FY 2014-15 the following year.

We realise that these changes will be somewhat burdensome, disruptive, and sometimes painful. Despite our best efforts, we may not have got everything right first time, but hope that any problems are minor and soluble. However, feedback at the recent Heart Rhythm Congress was very positive, and the relevance and importance of our changes was understood.

A final point: we believe that compliance with the national datasets is an inherent role of cardiac IT systems. For now, we will continue to provide a free web-based entry system (currently using Lotus Notes, though NICOR is exploring more modern alternatives). Further changes to the national datasets are likely to be tweaks, and we will give several months notice so that centres and IT providers have time to prepare. In return, we believe that commercial software providers should ensure that updates to the datasets are included automatically as part of their annual service contract, and should not require hard pressed Trusts to come up with extra cash every time there is a change.



Francis Murgatroyd

**Audit lead, British Heart
Rhythm Society
Chair, BHRS Registry and
Audit Steering Committee**



Nick Linker

**Secretary and
President Elect,
British Heart
Rhythm Society**

National Report: Introduction

The British Heart Rhythm Society (formerly Heart Rhythm UK) is pleased to present the eighth consecutive annual UK National Cardiac Rhythm Management Device Audit for the calendar year 2012. As Steven Furniss, BHRS President, recounts in his Foreword, the Device Audit Group which has been responsible for all the CRM audit reports to date - with the explicit support of the national society - is now collaborating more closely at a practical level with BHRS Council. This is a development which the core audit group has long sought and welcomes without reservation. The content of this and subsequent reports should thus rightly be seen as the product and responsibility of BHRS.

The CRM Device audit has always rooted its methodology in the demographics of geographical areas defined by the prevailing structure of the NHS. This has provided the unique ability to make valid comparison between the performance, both in total volume and equity of access to implantable cardiac devices, of those entities – until recently Primary Care Trusts and Cardiac Networks. The structural changes to the NHS inherent in the Health and Social Care Act 2012 have now given us Clinical Commissioning Groups (CCGs) and Local Area Teams (LATs), the geographical boundaries of which vary from the former structure. It is therefore evident that the precise demographics of the new structures may also vary from the old, which would invalidate direct and detailed local comparisons with the reports of previous years. To obviate this problem, and thus restore the comparability which is essential for assessing serial performance, the data for 2010 and 2011 have been re-analysed according to the new boundaries for the purposes of the 2012 Report.

However, it is worth emphasising that the core methodology of the CRM Device Audit remains unchanged. The power of its output benefits incrementally because of the ever increasing completeness and accuracy of the raw data supplied to it through the tireless efforts of hard pressed clinical physiologists, clinical staff, David Cunningham and his staff at NICOR, and the refinement of device classification systems – the latter relevant to the apparent change in ICD implant rates in 2012.

There have been no changes to agreed UK target implant rates for any of the three main device classes for several years [700 new implants/million (M) population for PM, 100 new implants/M for ICD and 130 total (new + replacement)/M for CRT], although there are cogent reasons for these to be revisited, as I advocated in the Introduction to the 2011 Report.

So, what are the headline results for 2012? In England, the PM new implant rate is 559/M, restoring progress from the plateau of 524/M in 2011. There has been an apparent fall in new ICD implant rates in all constituent countries of the UK, but this is in part due to a prior system mis-classification which gave an artificially high rate in 2011. The new ICD implant rate for England in 2012 is 66/M. Conversely, all UK countries have seen a striking rise in total CRT implant rates; the rate for England is 136/M with thirteen LATs exceeding the national target of 130/M. The implications of these changes are discussed within the body of the Report.

Whilst news on national implant rates is generally positive, it would be remiss of me to omit my usual and heartfelt caveat – the NHS provides poorly for UK patients who meet the professionally accepted criteria for cardiac device implantation. UK new implant rates remain substantially lower than those in comparable Western European countries (and much lower than those in the USA) for no identifiable reason of disease prevalence.

Postcode variability in access to therapy remains a fact of life. By contrast, there is much evidence that inadequacies in education, patient screening, referral pathways, and both human and capital resources for device medicine are significant culprits.

An inextricable part of the audit process should be to use the results as an engine for change. Great progress has been made in improving UK device therapy over the lifetime of these reports, but much remains to be done. There is no cause for complacency. I once again commend this Report to all healthcare colleagues who continue to strive every day for excellence in arrhythmia therapy for UK patients.

Dr Richard Charles
Lead Clinician, CRM Audit Reports.



Overview of Device Implants in the UK

General note: up to 2010, population estimates were year-on-year projections (from ONS) of the population, extrapolating from the 2001 census. In general these projections tend to under-estimate the true population. The 2011 rates use the accurate population from the 2011 census, so a slight increase in actual implant rate might be masked by replacing a population under-estimate with a true estimate. This and subsequent reports are based on the 2011 census (Note: the rates in these graphs are NOT adjusted for age and sex).

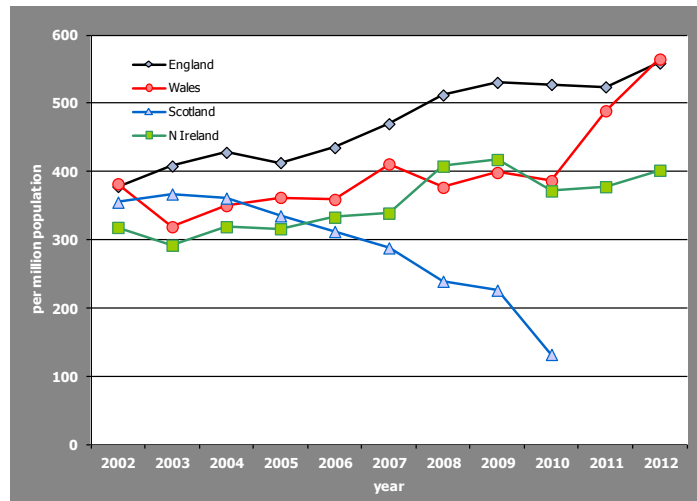
New Pacemakers

Comments

Pacemaker implant rate in England has increased (559 per million population).

Significant increase in new pacemaker rate in Wales and a slight increase in N Ireland.

Data submissions from Scotland have improved but are still incomplete.



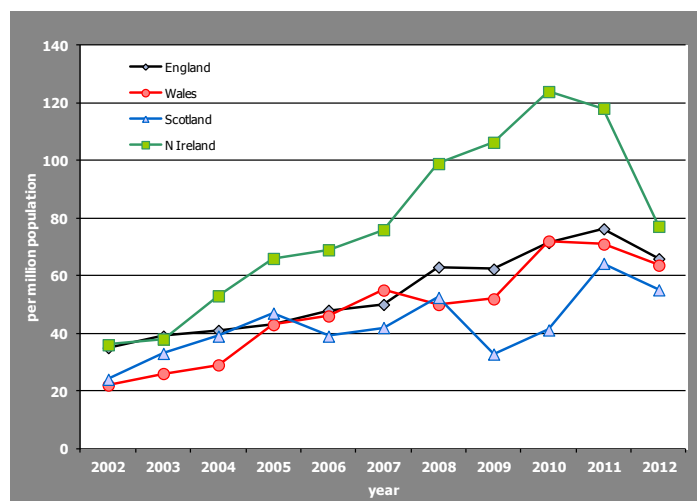
New ICDs

Comments

ICD rate fell significantly in N Ireland but still remains above the rest of the UK.

England and Wales rates have decreased from 2011.

Slight decrease in Scottish rate actually reflects better data submission, but is still not 100% complete.



Total CRTs

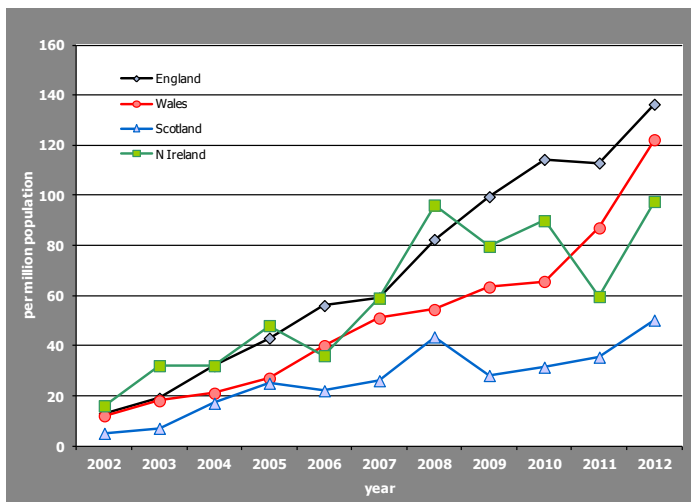
Comments

The total CRT rate (all implants CRT-P and CRT-D) for England has increased significantly, achieving the highest rate since these devices were introduced, as well as exceeding the national target of 130 for the first time.

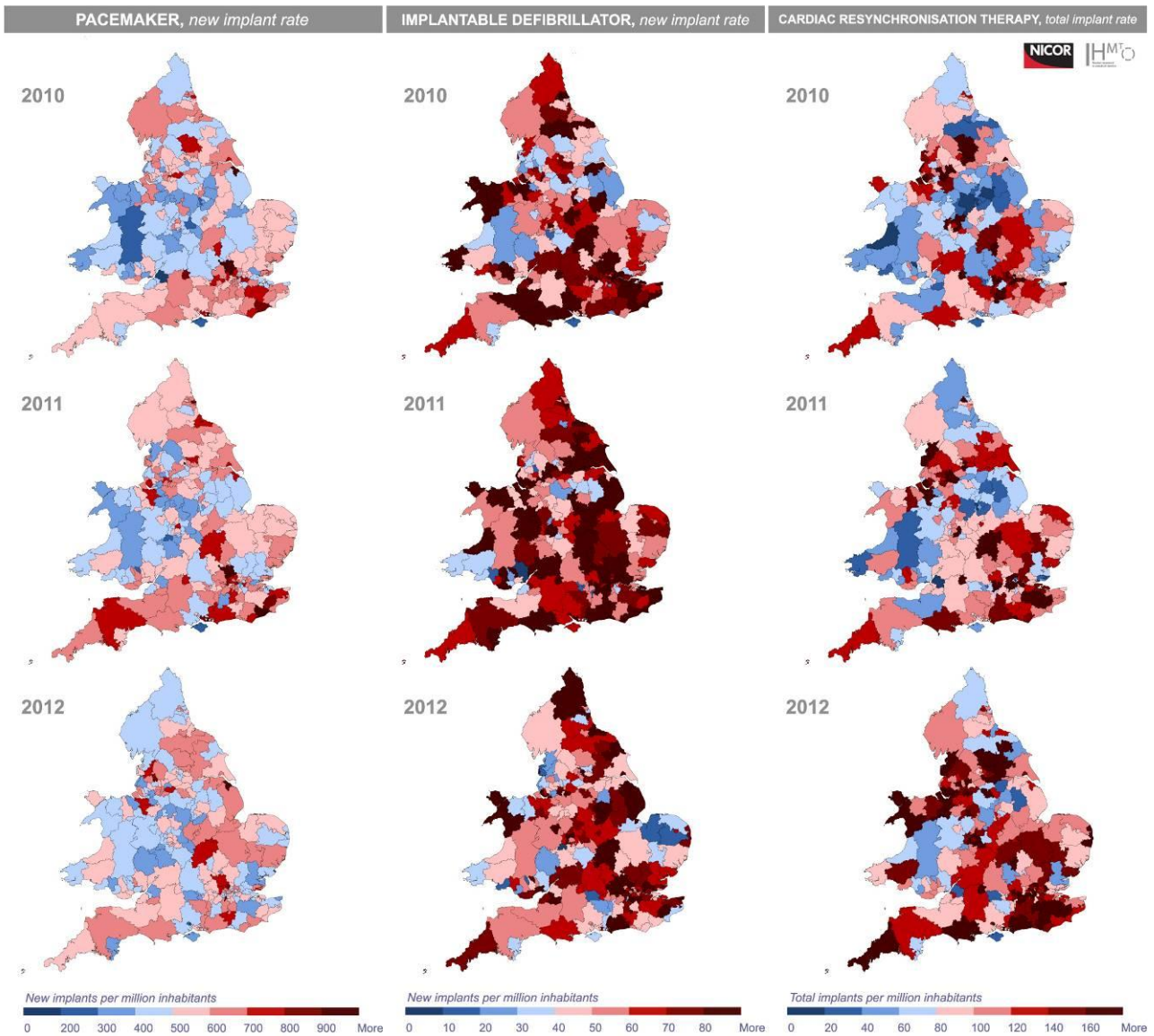
There was a large increase in the CRT rate in Wales.

The N Ireland implant rate has returned to 2008 levels after falling away in last few years.

The Scotland implant rate has increased but remains very low and well below the rest of the UK.



National Implant Rate Maps



It is immediately apparent that the 2012 pacing implant map is very similar to 2011.

In contrast, a decrease in ICD rate is shown by the fewer dark red colours on the centre map.

An increase in national CRT rate masks areas where the implant rate remains very low.

2012 Implant Rates in the LATs

Pacemakers

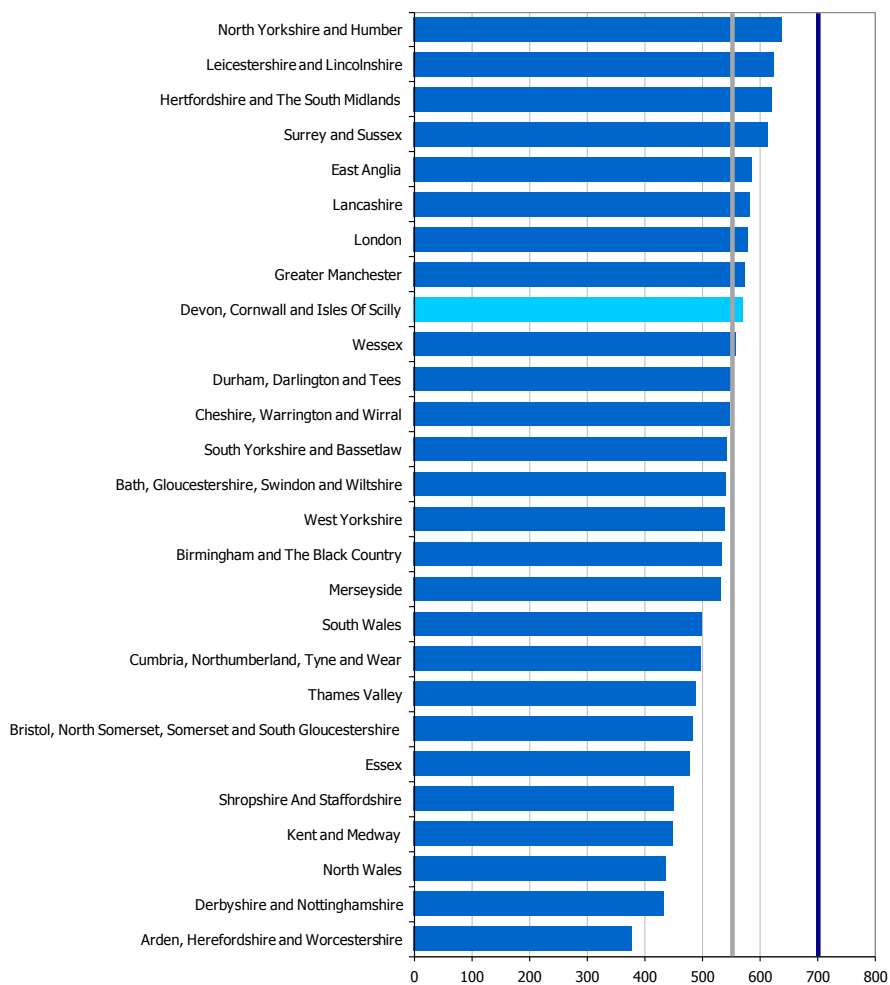
corrected for age and sex of LAT population

There has been a welcome increase in the national new pacemaker implant rate, this appears to have been achieved largely by increases in localities which have historically had the lowest implant rates, continuing the trend noted in the 2011 Report of regression towards the national mean rate, rather than the target rate. Comparable to 2011, no LAT approaches the target new PM implant rate of **700/M** population.

The grey line represents the national average rate. The blue line is the national target rate.

Pacemaker New Implant rate 2012

adjusted for age and sex



NB: North Wales and South Wales have a higher than average need for pacing so the adjusted rates shown here are lower than the unadjusted national rate for Wales shown on Page 12.

ICD

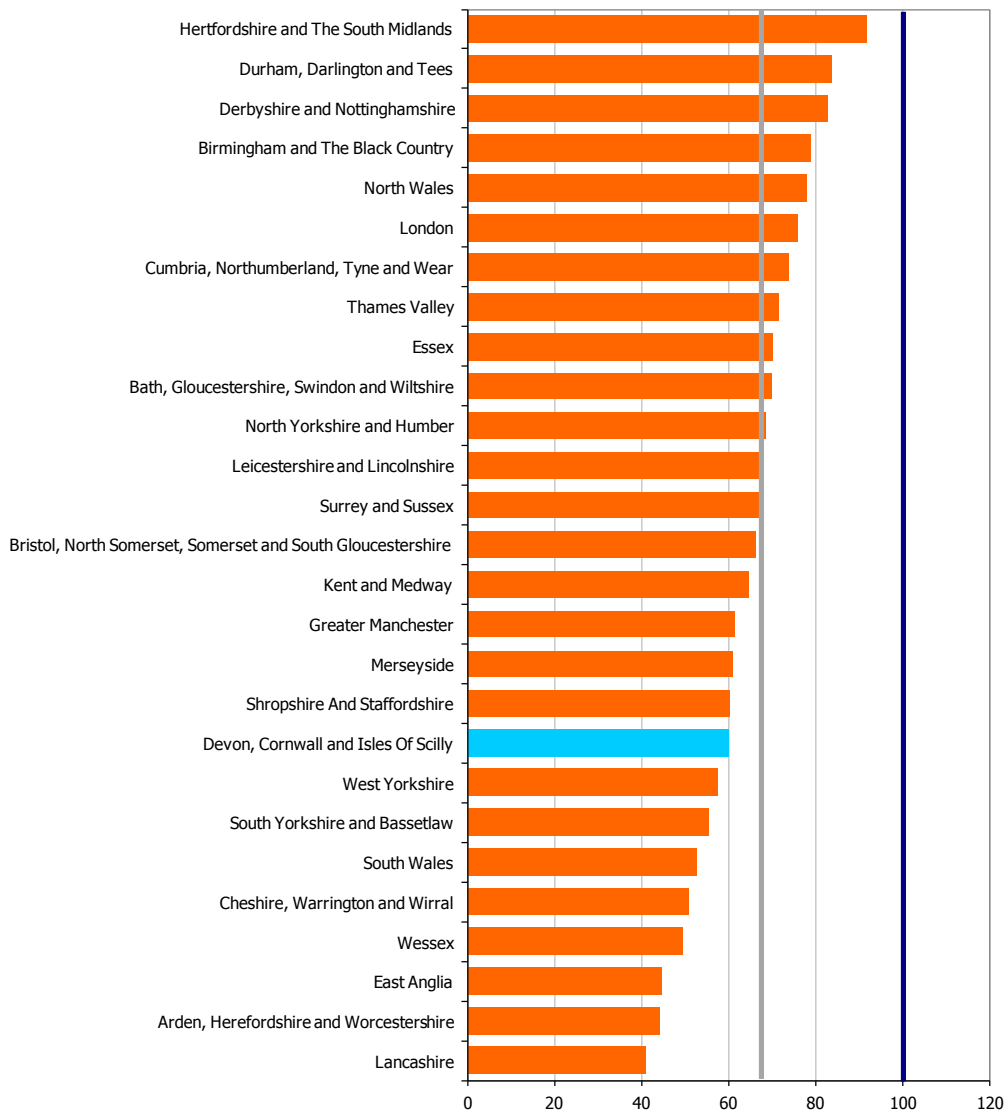
corrected for age and sex of LAT population

The national ICD implant rate in 2011 was artificially increased by the misclassification of certain devices which should have been recorded as CRT-D devices. This has now been identified and corrected but as the next graph shows, new ICD implant rates for Local Area Teams are all below the national target rate of **100/M** population.

As in previous analyses, the Lancashire area remains at a very low level. Hertfordshire & South Midlands is the only area to get close to the target rate.

The grey line represents the national average rate. The blue line is the national target rate.

ICD New Implant rate 2012 *adjusted for age and sex*



All CRT devices

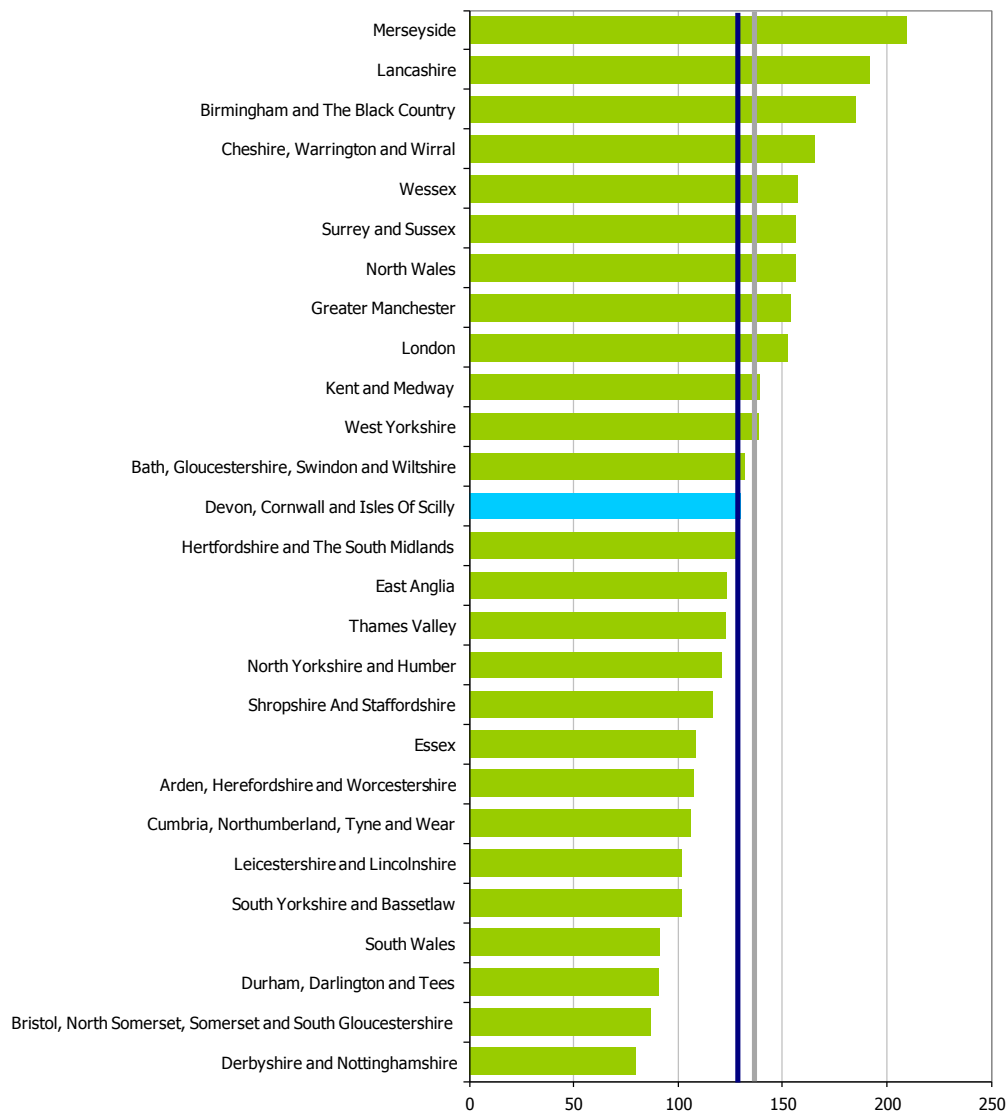
corrected for age and sex of LAT population

The striking increase in the national total CRT implant rate in 2012 appears to have been achieved by increases across the board - in localities historically registering both the lowest and highest rates. It is notable that the national mean implant rate (136/M) is now higher than the national target rate (**130/M**) for the first time.

Fourteen of the 27 LATs (include 2 Wales LHBs) have achieved or exceeded the national target rate in 2012.

The grey line represents the national average rate. The blue line is the national target rate.

All CRT Total Implant rate 2012
adjusted for age and sex

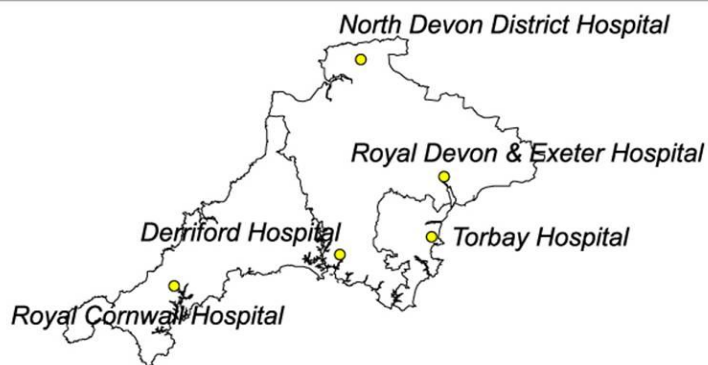


CCGs/LHBs in the LAT

LAT	Population
Devon, Cornwall and Isles Of Scilly	1,668,218

Code	CCG/LHB	Population
11N	Kernow	534,476
99P	North, East, West Devon	862,115
99Q	South Devon and Torbay	271,627

Devon, Cornwall & Isles of Scilly Area Team



● Pacemakers only ● All devices

Clinical Commissioning Group



Data Quality Statement

The quality of the analyses in this report is only as good as the quality of the data on which it is based.

That data is originally submitted by hospitals to the National Cardiac Rhythm Management Audit. If there is a deficit in registration, or if registrations do not contain a valid postcode, then analysis gaps are inevitable.

Data is then anonymised and extracted to provide the basis of this analysis. To minimise the risk of deficit errors, a threshold of 98% for registration and postcode completeness is sought for each hospital. Overall LAT completeness must reach 98% or a report will not be issued.

Every effort is made to ensure this report is as accurate as possible - however please contact us if you identify any residual problem and we will try to correct the error promptly.

Data Completeness and Data Quality for Key Hospitals in this LAT

Listed below are the most important data fields and their completion rates with CLINICALLY VALID entries. Note that any code which translates to "Unknown" or "Uncoded" is not considered to be clinically valid.

Centres that implanted at least 10 devices in the LAT in 2012

NB: Data quality is for all registered procedures for a centre in all LATs

LAT / Implant Centre	All Devices						ICD, CRT-D & CRT-P
	Valid Post Code	Valid NHS No	Valid Gender	Valid DOB	ECG	Symptom	Aetiology
Target	98.0%	98.0%	98.0%	98.0%	90.0%	90.0%	90.0%
England	99.4%	87.7%	99.8%	99.8%	93.1%	95.3%	95.0%
This LAT	100.0%	94.5%	99.7%	98.9%	91.6%	91.8%	91.3%
Bristol Royal Infirmary	100.0%	99.0%	100.0%	100.0%	99.3%	99.3%	99.2%
Musgrove Park Hospital	99.4%	94.7%	97.9%	96.1%	99.1%	98.5%	94.9%
North Devon District Hospital	98.2%	68.4%	100.0%	98.2%	30.4%	33.9%	-
Royal Brompton Hospital	99.3%	89.2%	100.0%	100.0%	98.1%	94.2%	98.2%
Derriford Hospital	99.0%	97.1%	100.0%	98.1%	99.2%	99.5%	100.0%
Royal Cornwall Hospital	100.0%	99.6%	100.0%	100.0%	96.4%	97.2%	98.6%
Royal Devon & Exeter Hospital	100.0%	97.5%	99.6%	99.2%	86.1%	85.6%	81.8%
St Thomas' Hospital	100.0%	94.3%	98.7%	100.0%	98.4%	98.6%	98.0%
Torbay Hospital	99.5%	74.9%	99.5%	98.4%	98.4%	98.4%	100.0%

Target Achieved
Below 50% of target
(-) = No Implants

LAT / Implant Centre	CRT-D & ICD			CRT-D & CRT-P	Overall index of valid data completeness
	NYHA Dyspnoea Status	LV Function	ICD Indication	QRS duration	
Target	90.0%	90.0%	90.0%	90.0%	90.0%
England	76.9%	81.6%	74.2%	41.3%	85.8%
This LAT	79.4%	82.0%	80.5%	74.6%	89.5%
Bristol Royal Infirmary	97.8%	97.8%	98.4%	70.7%	96.5%
Musgrove Park Hospital	98.5%	98.5%	0.0%	0.0%	79.8%
North Devon District Hospital	-	-	-	-	71.5%
Royal Brompton Hospital	64.3%	80.9%	71.7%	60.2%	86.9%
Derriford Hospital	97.7%	97.7%	98.9%	95.7%	98.4%
Royal Cornwall Hospital	85.2%	87.8%	80.9%	69.1%	92.3%
Royal Devon & Exeter Hospital	68.5%	72.8%	78.3%	68.4%	85.2%
St Thomas' Hospital	72.6%	96.5%	1.5%	0.0%	78.1%
Torbay Hospital	-	-	-	85.7%	94.4%

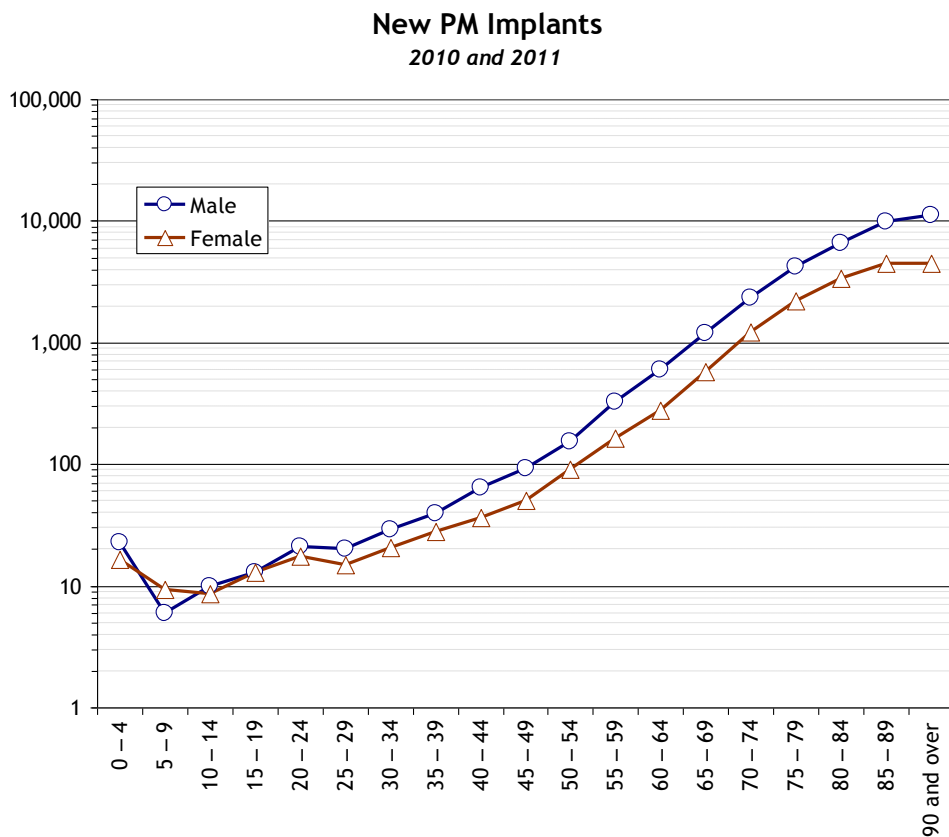
Please note: for every data completeness category shown, a hospital must have performed at least 10 cases before a value will be displayed.

Target Achieved
Below 50% of target
(-) = No Implants

Correcting Implant Rates for Age and Sex

Calculating Need

- Most pacemakers are implanted for conduction system disease, which is predominantly a disease of the elderly. The graph shows the percentage of the population in 5 year age bands, and the percentage of pacemaker implants. Only 11% of the population are aged 70 or more, but they receive 76% of all pacemaker implants.
- Men also receive more pacemakers than women. Although the national average new implant rate is 559, it reaches more than 11,000 in men aged more than 90 (see graph below - note vertical axis is logarithmic). So the proportion of older people in a local population will strongly influence how many pacemakers need to be implanted.
- If we examine closely the age and sex distribution of the local population of a CCG (LHB in Wales) or LATs, we can work out how many pacemakers we would EXPECT to see implanted, compared to the national average. The ratio of the local and national rate is called the Relative Need, and we calculate this for both pacemakers and ICDs.
- So, for example, in London the population is relatively young. Only 8% are aged 70 or more, compared to the national average of 12%. This means that this network doesn't need as many pacemaker implants relative to the nation as a whole. Their Relative Need for Pacing is calculated to be 70% of the national average.
- In contrast, Devon & Cornwall has a more elderly population, with 16% aged 70 or over. Their Relative Need for Pacing is 130%.



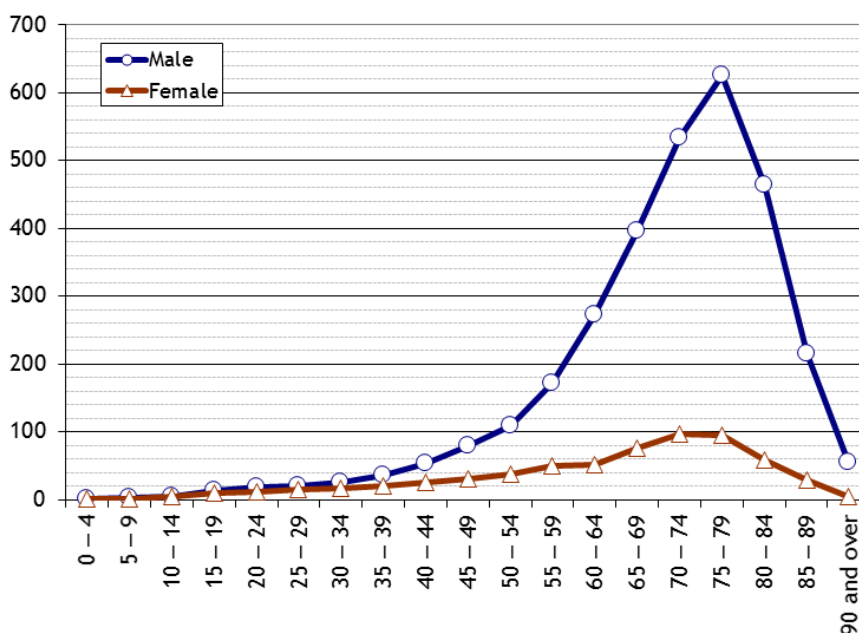
Using Relative Need

- We want to make a fair and valid comparison between CCGs/LHBs, LAT and the National Average. That means we should correct for relative need. So, for example, if London has a pacing rate of 490, and Devon & Cornwall has a rate of 910, are they different? London's adjusted rate is 490 divided by relative need (70%) = 700. Devon & Cornwall's adjusted rate is 910 divided by 130% = 700.
- So the adjusted rates for these two areas are the same, despite the major apparent difference in their unadjusted rates.

Implantable Defibrillators

- The diseases for which ICDs are implanted are not the same as for pacemakers, and tend to occur in slightly younger people. These diseases are principally ischaemic heart disease and cardiomyopathy.
- We therefore need to calculate a separate relative need factor for ICDs. The graph (right) of new ICD implant rate in 2010 and 2011 shows that ICDs are also predominantly implanted in older people.
- Unlike pacemakers, the ICD implant rate starts to decline over the age of 75. The influence of a local elderly population of need for ICDs will therefore still be present, but just slightly less in magnitude than for pacemakers. Devon & Cornwall, for instance, has a relative ICD need of 119%.

New ICD Implants
2010 and 2011

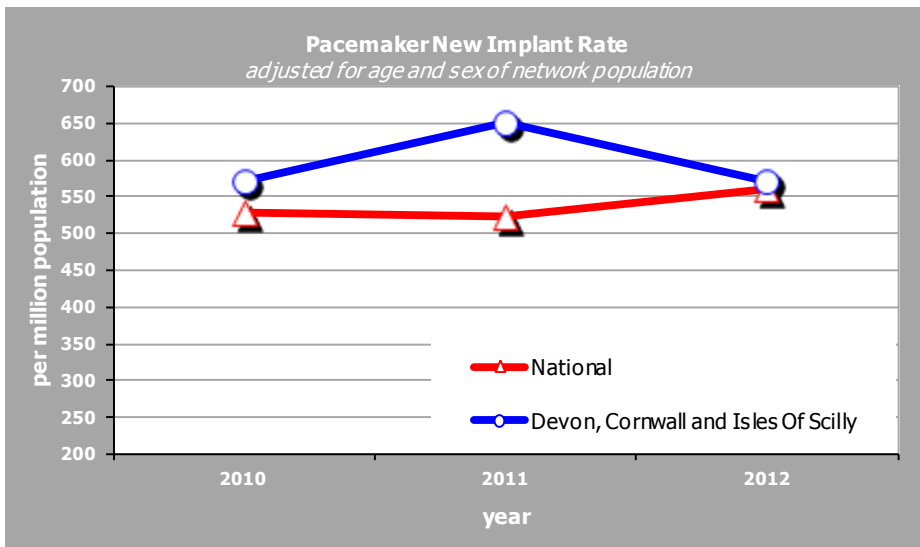


Centres providing Device Implants to this LAT

All implants in this LAT in 2012

		Pacemakers	ICDs	CRTs	Total
RDE	Royal Devon & Exeter Hospital	576	42	76	694
PLY	Derriford Hospital	502	51	69	622
RCH	Royal Cornwall Hospital	330	43	94	467
TOR	Torbay Hospital	173	1	14	188
NDD	North Devon District Hospital	48	5	1	54
BRI	Bristol Royal Infirmary	10	7	2	19
STH	St Thomas' Hospital	8	4	2	14
MPH	Musgrove Park Hospital	11	1	1	13
NHB	Royal Brompton Hospital	7	2	2	11
SGH	Wessex Cardiothoracic Centre	5	3	0	8
GEO	St George's Hospital	2	3	0	5
HH	Harefield Hospital	2	1	2	5
UCL	University College Hospital	2	0	3	5
BRC	Bristol Royal Hospital For Children	3	1	0	4
HSC	Harley Street Clinic	2	1	0	3
PAP	Papworth Hospital	2	1	0	3
YEO	Yeovil District Hospital	3	0	0	3
BAT	Royal United Hospital Bath	2	0	0	2
WDH	Dorset County Hospital	1	1	0	2
ASH	Wansbeck General Hospital	1	0	0	1
BOU	Royal Bournemouth Hospital	1	0	0	1
FRM	Frimley Park Hospital	0	0	1	1
MOR	Morrison Hospital	0	1	0	1
MRI	Manchester Royal Infirmary	0	0	1	1
NGS	Northern General Hospital	1	0	0	1
NOR	Norfolk and Norwich Hospital	1	0	0	1
PGH	Poole Hospital	1	0	0	1
QEB	Queen Elizabeth Hospital Edgbaston	1	0	0	1
RAD	John Radcliffe Hospital	0	1	0	1
RSC	Royal Sussex County Hospital	0	1	0	1
STM	St Mary's Hospital Paddington	1	0	0	1
VIC	Blackpool Victoria Hospital	1	0	0	1
WAL	University Hospital Coventry	1	0	0	1
WYT	Wythenshawe Hospital	1	0	0	1

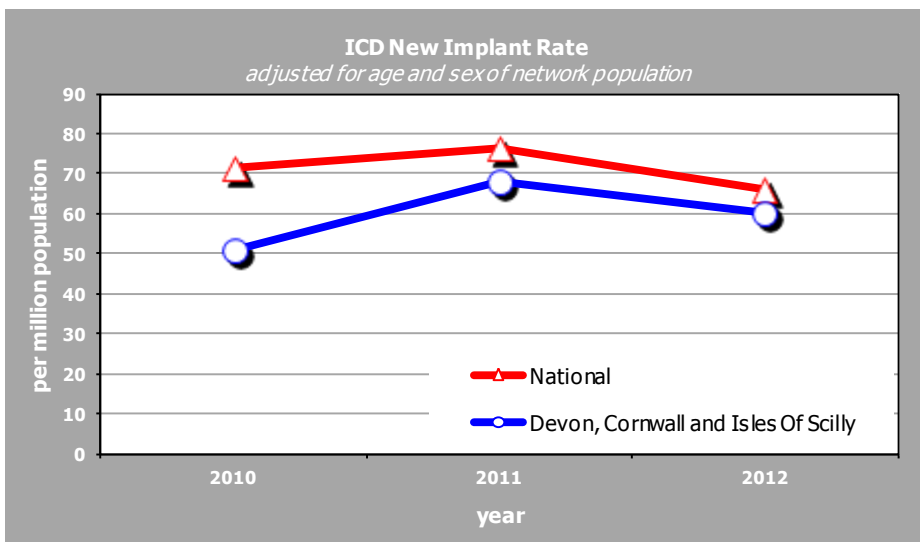
3 Year Implant Trends - LAT v National



Pacemakers

(national target: 700 new implants per million population)

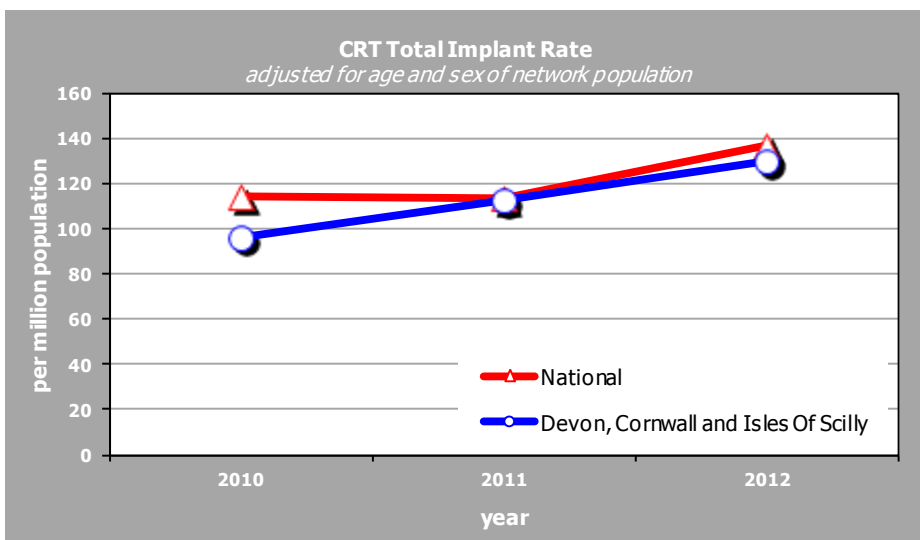
PM implant rate has decreased in 2012 and tracks the national average.



ICD

(national target: 100 new implants per million population)

ICD implant rate has decreased in 2012 and tracks below the national rate.



CRT

(national target: 130 total implants per million population)

CRT implant rate has improved in 2012 but remains just below the national average.

Provider Hospitals: which hospitals serve which CCGs/LHBs?

All implants in this LAT in 2012

PACEMAKERS

CCG/LHB	Implanting Centre		Implants
11N	RCH	Royal Cornwall Hospital	329
Kernow	PLY	Derriford Hospital	128
	RDE	Royal Devon & Exeter Hospital	16
	NDD	North Devon District Hospital	3
	BRC	Bristol Royal Hospital For Children	2
	PAP	Papworth Hospital	2
	UCL	University College Hospital	2
	ASH	Wansbeck General Hospital	1
	BRI	Bristol Royal Infirmary	1
	MPH	Musgrove Park Hospital	1
	QEB	Queen Elizabeth Hospital Edgbaston	1
	SGH	Wessex Cardiothoracic Centre	1
99P	RDE	Royal Devon & Exeter Hospital	549
North, East, West Devon	PLY	Derriford Hospital	346
	NDD	North Devon District Hospital	45
	MPH	Musgrove Park Hospital	10
	STH	St Thomas' Hospital	8
	TOR	Torbay Hospital	8
	BRI	Bristol Royal Infirmary	7
	NHB	Royal Brompton Hospital	4
	SGH	Wessex Cardiothoracic Centre	3
	YEO	Yeovil District Hospital	3
	BAT	Royal United Hospital Bath	2
	GEO	St George's Hospital	2
	HSC	Harley Street Clinic	2
	BOU	Royal Bournemouth Hospital	1
	HH	Harefield Hospital	1
	NGS	Northern General Hospital	1
	NOR	Norfolk and Norwich Hospital	1
	RCH	Royal Cornwall Hospital	1
	STM	St Mary's Hospital Paddington	1
	VIC	Blackpool Victoria Hospital	1
	WDH	Dorset County Hospital	1

99Q			
South Devon and Torbay	TOR	Torbay Hospital	165
	PLY	Derriford Hospital	28
	RDE	Royal Devon & Exeter Hospital	11
	NHB	Royal Brompton Hospital	3
	BRI	Bristol Royal Infirmary	2
	BRC	Bristol Royal Hospital For Children	1
	HH	Harefield Hospital	1
	PGH	Poole Hospital	1
	SGH	Wessex Cardiothoracic Centre	1
	WAL	University Hospital Coventry	1
	WYT	Wythenshawe Hospital	1

ICDs

Implantable Cardioverter Defibrillators

CCG/LHB	Implanting Centre		Implants
11N Kernow	RCH	Royal Cornwall Hospital	43
	PLY	Derriford Hospital	12
	RDE	Royal Devon & Exeter Hospital	4
	BRI	Bristol Royal Infirmary	2
	MOR	Morrison Hospital	1
	RAD	John Radcliffe Hospital	1
	99P North, East, West Devon	RDE	Royal Devon & Exeter Hospital
PLY		Derriford Hospital	31
NDD		North Devon District Hospital	5
STH		St Thomas' Hospital	4
BRI		Bristol Royal Infirmary	3
GEO		St George's Hospital	3
BRC		Bristol Royal Hospital For Children	1
HH		Harefield Hospital	1
MPH		Musgrove Park Hospital	1
PAP		Papworth Hospital	1
RSC		Royal Sussex County Hospital	1
WDH		Dorset County Hospital	1
99Q South Devon and Torbay		PLY	Derriford Hospital
	RDE	Royal Devon & Exeter Hospital	3
	SGH	Wessex Cardiothoracic Centre	3
	BRI	Bristol Royal Infirmary	2
	NHB	Royal Brompton Hospital	2
	HSC	Harley Street Clinic	1
	TOR	Torbay Hospital	1

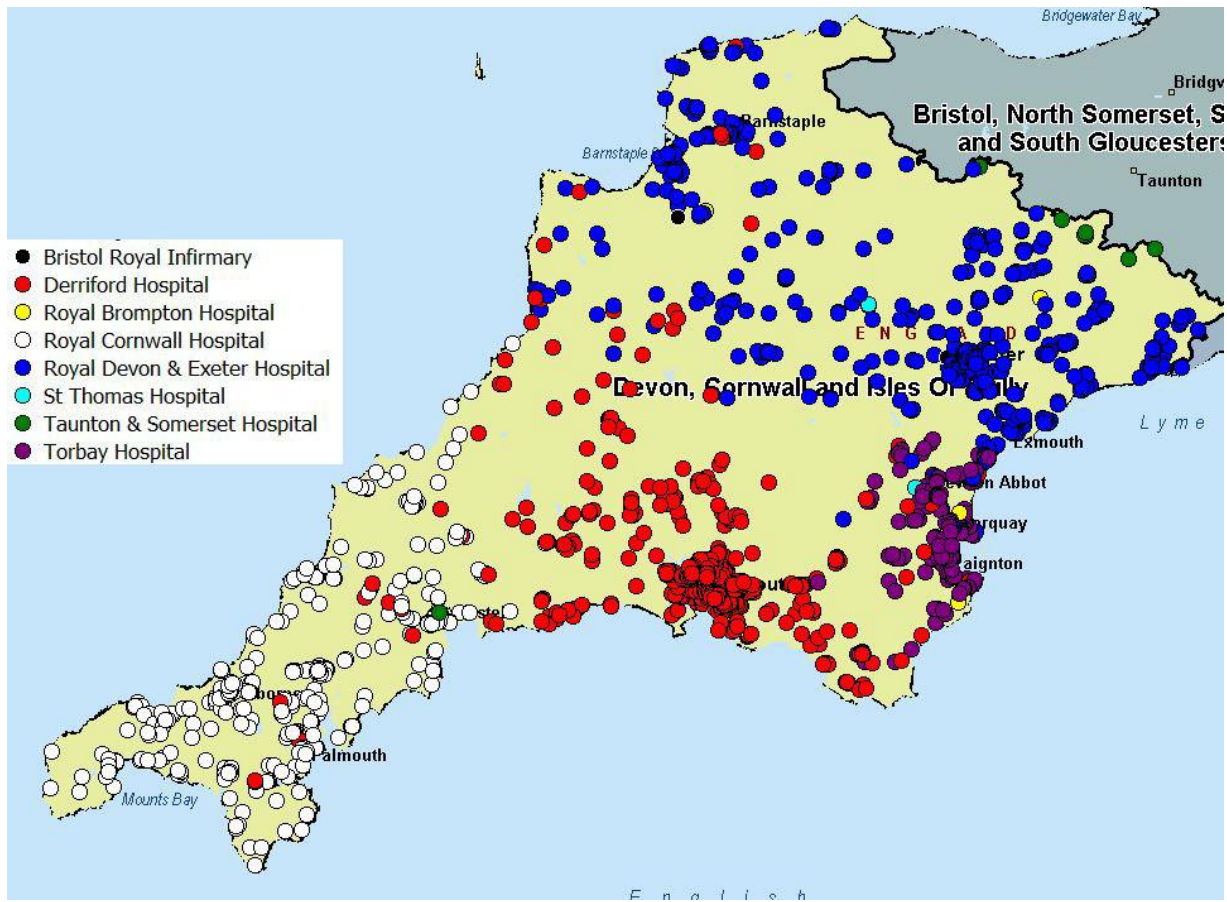
CRTs

Cardiac Resynchronisation Therapy

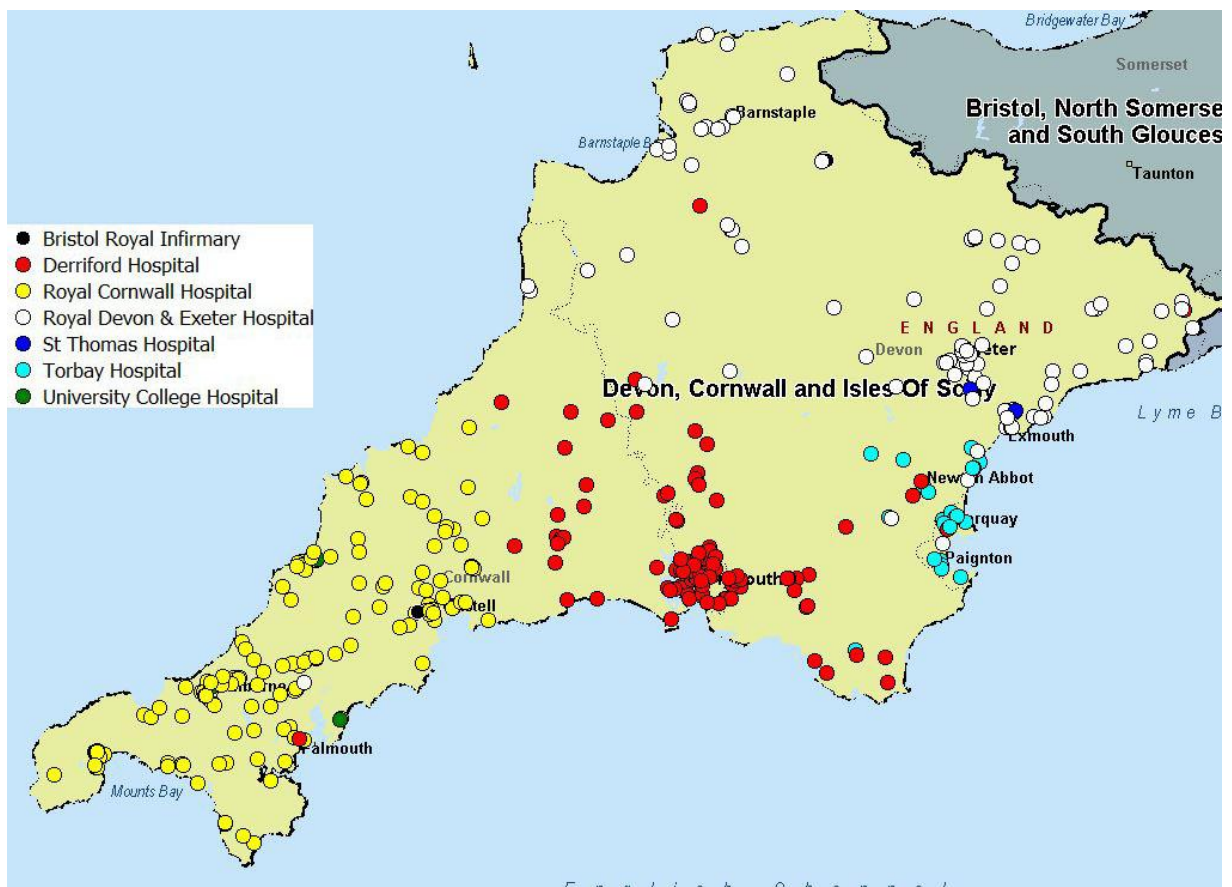
CCG/LHB	Implanting Centre		Implants
11N	RCH	Royal Cornwall Hospital	94
Kernow	PLY	Derriford Hospital	13
	UCL	University College Hospital	3
	RDE	Royal Devon & Exeter Hospital	2
	MRI	Manchester Royal Infirmary	1
	NHB	Royal Brompton Hospital	1
99P	RDE	Royal Devon & Exeter Hospital	69
North, East, West Devon	PLY	Derriford Hospital	48
	BRI	Bristol Royal Infirmary	2
	HH	Harefield Hospital	2
	STH	St Thomas' Hospital	2
	FRM	Frimley Park Hospital	1
	MPH	Musgrove Park Hospital	1
	NDD	North Devon District Hospital	1
	TOR	Torbay Hospital	1
99Q	TOR	Torbay Hospital	13
South Devon and Torbay	PLY	Derriford Hospital	8
	RDE	Royal Devon & Exeter Hospital	5
	NHB	Royal Brompton Hospital	1

Geographical Location of Implants

Pacemaker Implants



Complex Implants (ICD and CRT)



Pacing Mode in this LAT: Physiological vs Non-Physiological

There is ample evidence that atrial-based pacing modes (also known as physiological pacing modes) improve patients' quality of life, and may also prolong survival. NICE Guidance (TA88, 2005) has confirmed the desirability of physiological pacing when appropriate.

30 years ago all pacemakers were ventricular-based, i.e. the only part of the heart which was stimulated was the lower chambers. Increasingly, atrial-based (mainly dual chamber) pacing has replaced the ventricular modes, a trend which is beneficial to patients.

It is not possible, or desirable, to completely eradicate ventricular pacing. Patients in permanent atrial fibrillation cannot benefit from atrial-based pacing, and this is a significant subgroup in the elderly.

Mode	% for this LAT	England %
Atrial based modes		
DDDR	68.38%	68.01%
DDD	0.66%	2.11%
AAIR		0.34%
AAI		0.08%
Other		0.56%
Ventricular based modes		
VVIR	30.46%	28.16%
VVI	0.50%	0.73%

- The proportion of physiological pacing in this LAT is lower than the national average.

Pacing Mode for New Implants by Centre

Only implants in this LAT

	DDD	DDDR	AAI	AAIR	Other physiological	All physiological	VVI	VVIR
NATIONAL	2.1%	68.0%	0.1%	0.3%	0.6%	71.1%	0.7%	28.2%
This LAT	0.7%	68.4%	0.0%	0.0%	0.0%	69.0%	0.5%	30.5%
Bristol Royal Infirmary		50.0%				50.0%		50.0%
Derriford Hospital		75.0%				75.0%		25.0%
Musgrove Park Hospital		75.0%				75.0%		25.0%
North Devon District Hospital		64.7%				64.7%		35.3%
Royal Brompton Hospital		100.0%				100.0%		
Royal Cornwall Hospital	2.5%	69.3%				71.7%	2.0%	26.2%
Royal Devon & Exeter Hospital	0.2%	57.5%				57.7%		42.3%
Torbay Hospital		88.1%				88.1%	0.9%	11.0%

- Most of the hospitals in this LAT implant mainly physiological pacemakers above or at a level consistent with the national average.
- Three hospitals implanted below the national average, with Bristol Royal Infirmary at the lowest rate of 50%.

Note: Any hospital in the LAT that implanted at least 10 devices in 2012.

Note: 'Pacing Mode' is based on the maximum mode of which the device is capable, and not the programmed mode at the end of the procedure.

Physiological Pacing in Sick Sinus Syndrome

Only implants in this LAT

There is ample evidence from major clinical trials and support from NICE guidelines (NICE Technology Appraisal 88, 2005) that use of ventricular pacing modes in patients with sick sinus syndrome can lead to poor outcomes, notably an increased incidence of atrial fibrillation and pacemaker syndrome.

Pacing modes in sick sinus syndrome should be atrial based (i.e. dual chamber or atrial). The Western European average in 2005 was 92% atrial based pacing for SSS. In the UK the average was 84% in 2010 and 84% in 2011 and 87% in 2012.

Any percentage of ventricular based pacing greater than 10% has been shaded pink, and may be considered higher than desirable. A percentage greater than 20% is considered definitely too high and is shown in a shaded red box. Percentages greater than 50% are shown shaded black.

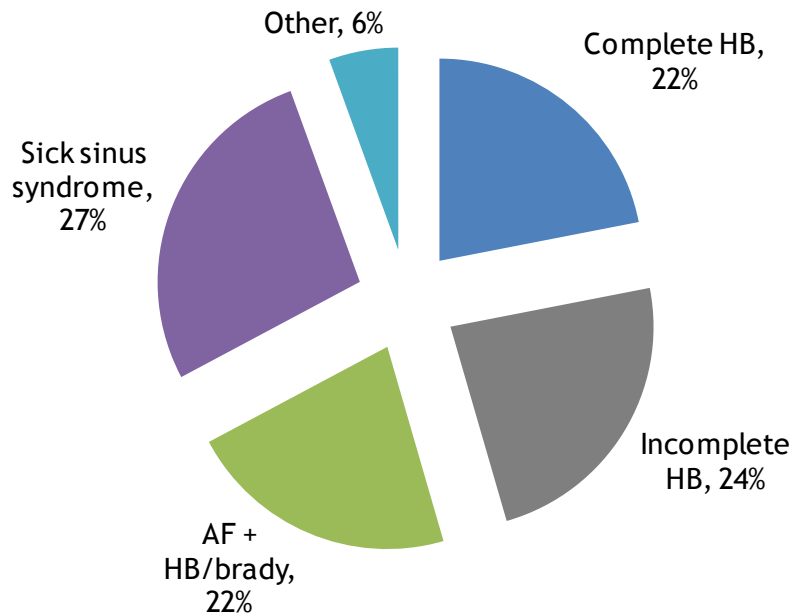
	New Implants for Sick Sinus Syndrome	% Atrial-based New Implants for SSS	% Ventricular-based New Implants for SSS
England		86.5%	13.5%
This LAT		90.6%	9.4%
Derriford Hospital	91	94.5%	5.5%
Royal Cornwall Hospital	74	91.9%	8.1%
Royal Devon & Exeter Hospital	95	85.3%	14.7%
Torbay Hospital	29	93.1%	6.9%

Note: Any hospital in the LAT but not in this list did not code at least 10 implants as SSS.

Note: For this analysis only ECG codes E1-E5 are used for SSS. Code E6 is excluded.

ECG Indication for New Pacemaker Implants

ECG Indication for all new implants in England 2012



AF: atrial fibrillation
HB: heart block
Brady: bradycardia

	Complete HB	Incomplete HB	AF + HB/brady	Sick sinus syndrome	Other
NATIONAL	21.9%	23.6%	21.7%	27.3%	5.5%
This LAT	22.5%	24.1%	20.5%	28.0%	4.9%
Derriford Hospital	26.9%	23.3%	14.4%	29.8%	5.6%
Musgrove Park Hospital		12.5%	25.0%	62.5%	
North Devon District Hospital	50.0%	25.0%	8.3%	8.3%	8.3%
Royal Brompton Hospital	100.0%				
Royal Cornwall Hospital	19.4%	19.8%	25.0%	31.9%	3.9%
Royal Devon & Exeter Hospital	19.8%	27.1%	25.2%	23.2%	4.6%
Torbay Hospital	24.3%	28.0%	15.0%	27.1%	5.6%

Note: Any hospital that implanted at least 10 devices in the LAT in 2012.
 NB: all new PM implants in this LAT.

Relative Need for Pacemakers, ICDs and CRTs

National new implant rates 2012:

Pacemaker: 559

new implants

ICD: 66

new implants

CRT: 136

total implants

A CCG with a relatively OLD population will need relatively MORE implants compared to a CCG with a young population, because the incidence of indications for pacing and ICD is higher in older people.

Code	CCG/LHB	Relative Need for Pacing	Required Rate to be comparable with national average	Relative Need for ICD	Required Rate to be comparable with national average	Relative Need for CRT	Required Rate to be comparable with national average
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	Devon, Cornwall and Isles Of Scilly	130%	727	119%	79	125%	170
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11N	Kernow	129%	723	122%	81	128%	174
99P	North, East, West Devon	125%	701	115%	76	120%	163
99Q	South Devon and Torbay	146%	817	127%	84	136%	185

Note:

- "Required" implant rates are relative to the national average rate, but are corrected depending on the age and sex distribution of the local population.
- For Pacemakers, the required implant rate will be higher if the percentage of older people in the CCG is higher.
- For ICDs and CRTs, the same general rule applies, but the pattern is slightly different, because these devices have a different age/sex distribution.
- These relative rates will be used to correct the observed rates and produce a truer reflection of local implant rates vs. local need.

New Pacemaker Implant Rates corrected for Age and Sex

Explanatory note:

The "corrected rate" (R), expressed as implants per million population, is calculated using the following formula:

$$R = \frac{A}{B.C} \times 10^6$$

where

A = number of new implants

B = population

C = relative need

2012 New Pacemaker Implant Rates for CCGs in this LAT

	Population	Need for Pacing	New PM Implants	Corrected New PM Implant Rate	Deficit/ Excess 2012 compared to rate of 700
England		100%		559	
This LAT	1,668,218	130.0%	1205	571	-18%
11N Kernow	534,476	129.3%	348	518	-26%
99P North, East, West Devon	862,115	125.4%	714	679	-3%
99Q South Devon and Torbay	271,627	146.2%	143	370	-47%

New ICD Implant Rates *corrected for Age and Sex*

2012 ICD Implant Rates for CCGs in this LAT

	Population	Need for ICD	New ICD Implants	Corrected New ICD Implant Rate	Deficit/ Excess 2012 compared to rate of 100
England		100%		66	
This LAT	1,668,218	119.0%	119	60	-40%
11N Kernow	534,476	122.0%	48	74	-26%
99P North, East, West Devon	862,115	114.7%	58	59	-41%
99Q South Devon and Torbay	271,627	126.7%	13	38	-62%

Total CRT Implant Rates *corrected for Age and Sex*

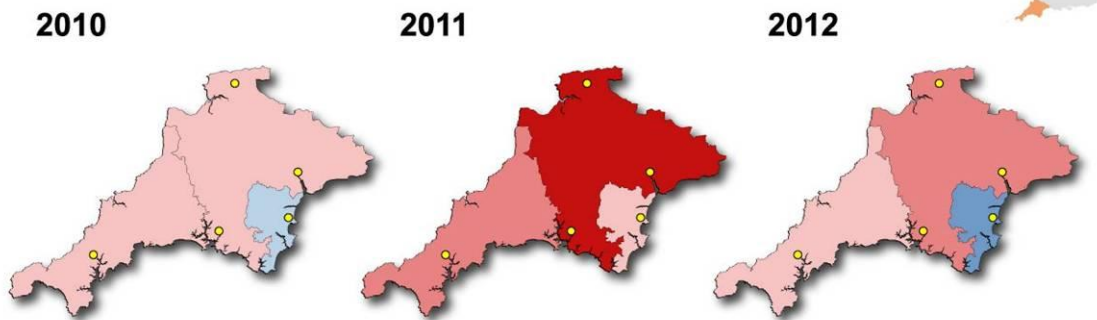
2012 Total CRT Implant Rates for CCGs in this LAT

	Population	Need for Total CRT	Total CRT Implants	Corrected Total CRT Implant Rate	Deficit/ Excess 2012 compared to rate of 130
England		100%		136	
This LAT	1,668,218	125.2%	268	130	0%
11N Kernow	534,476	127.8%	114	169	30%
99P North, East, West Devon	862,115	120.1%	127	124	-4%
99Q South Devon and Torbay	271,627	136.1%	27	74	-43%

New Implant Rate Maps

PACEMAKER, new implant rate

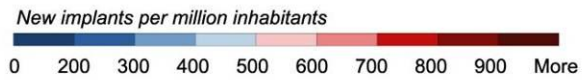
NICOR IHMT



Realisation : IHMT - 2013

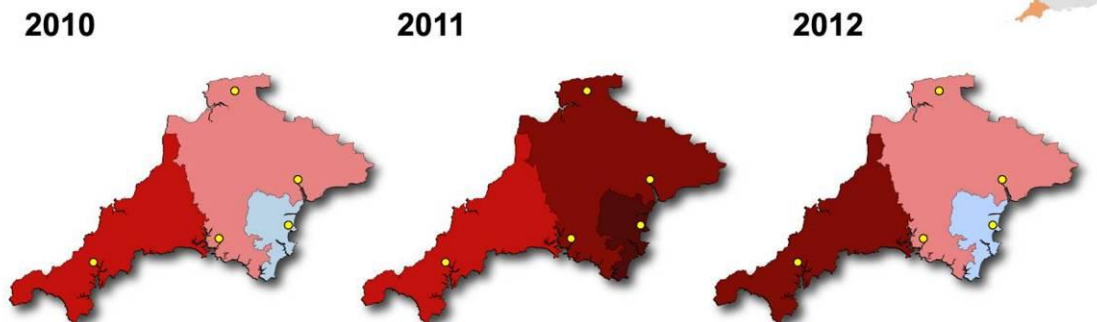
- Pacemakers only
- All devices

CCG



ICD, new implant rate

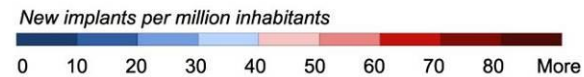
NICOR IHMT



Realisation : IHMT - 2013

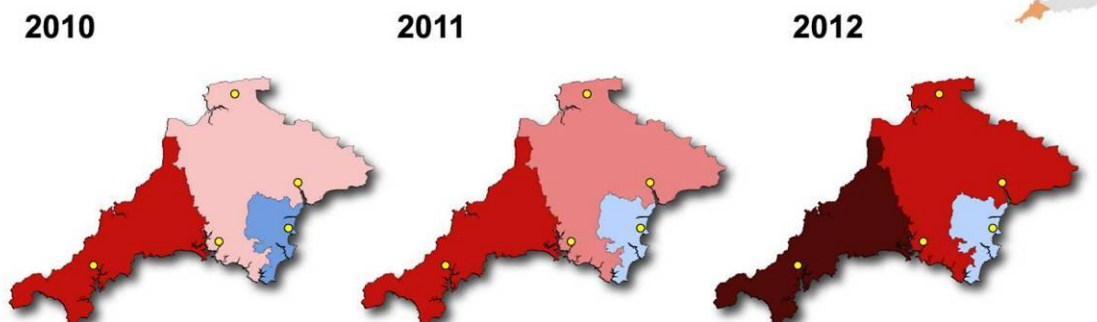
- Pacemakers only
- All devices

CCG



CRT, total implant rate

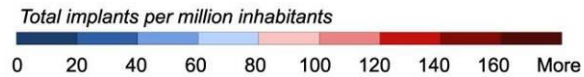
NICOR IHMT



Realisation : IHMT - 2013

- Pacemakers only
- All devices

CCG

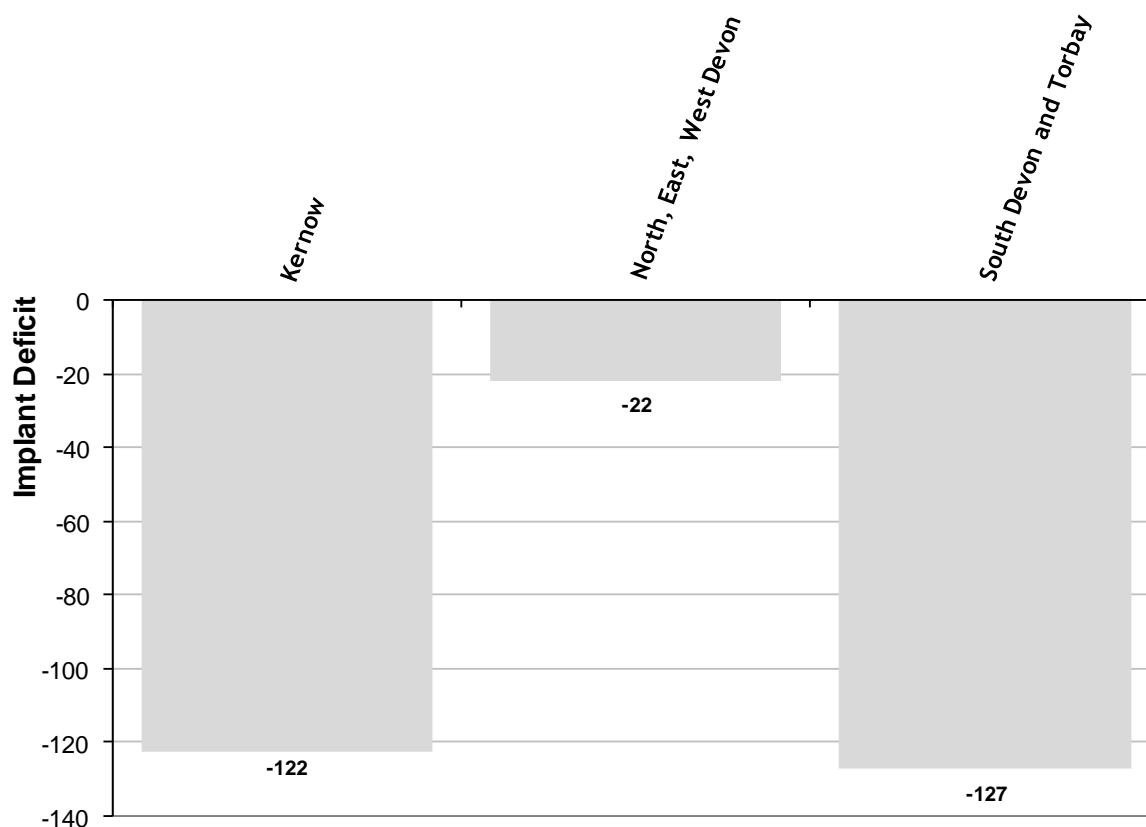


Pacemaker Implant Deficit in 2012

The table below shows how many extra pacemakers each CCG would need to commission to bring the implant rate up to the national recommended target rate for new pacemaker implants (700).

If the value shown is zero, then the CCG is already commissioning enough devices to reach the target rate.

		Population	Deficit/ Excess 2012 compared to rate of 700	New Pacemaker Implant Deficit (number of devices)
11N	Kernow	534,476	-26%	122
99P	North, East, West Devon	862,115	-3%	22
99Q	South Devon and Torbay	271,627	-47%	127



Conclusions

- The LAT's population is older than average and there is a consequent 30% increased need for pacemakers and 19% for ICDs, compared with the national average.
- The PM and ICD rates both decreased in 2012. The CRT rate has increased significantly. All three rates track very close to the national average.
- There is substantial variability in rates between CCGs in the LAT. The CRT rate for Kernow CCG has exceeded the national target.
- Data quality and completeness is generally good for basic fields, but there are major deficits for clinical data concerning complex devices implants. Correction of these deficits will enhance the value of future audits.
- Royal Devon & Exeter Hospital (15%) has a higher than desirable rate of ventricular based pacing for sick sinus syndrome. This is not compliant with current NICE Guidance.