SCOTTISH NATIONAL OBSTETRIC BRACHIAL PLEXUS INJURY SERVICE

ANNUAL REPORT 2011-12

Greater Glasgow & Clyde
Health Board

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The completed Annual Report should be sent electronically by 31 May to:

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Section A : Service/Programme

A2 Aim / Purpose / Mission Statement / Date of Designation

The Paediatric Brachial Plexus Injury Service, based at the Royal Hospital for Sick Children, Glasgow and became a designated National Service in April 2006.

It provides an integrated multidisciplinary service for obstetric brachial plexus injury, traumatic brachial plexus injury and tumours involving the brachial plexus including:

- **Diagnosis:** Clinical, MRI, Ultrasound, Neurophysiology.
- **Surgery:** Early surgical exploration and nerve repair
  Secondary reconstruction for shoulder and other deformities
- **Physiotherapy**

A3 Description of Patient Pathway

A3 a) Target Group for Service or Programme

Children with obstetric brachial plexus injury are the main group managed by the service. When necessary children with traumatic brachial plexus injury or tumours involving the brachial plexus are seen.

A3 b) Abbreviated Care Pathway for Service or Programme

Children with obstetric brachial plexus injury (OBPI) referred to the service are assessed in the outpatient clinic by medical staff and physiotherapists to confirm the diagnosis and likely prognosis. Some children have already been seen by the specialist physiotherapists and advice given on exercises. A management plan is formulated including ongoing physiotherapy, investigations when necessary, and monitoring of progress.

Surgery is carried out for:

- Exploration and surgical repair of the nerves of the brachial plexus in a small number of children with the most severe lesions which have not shown signs of recovery by 3 to 6 months of age.
- Joint releases, tendon transfers, bony procedures and free functioning muscle transfers for upper limb deformities resulting from OBPI. These most commonly affect the shoulder.

Children with persisting deficit are followed up in outpatients at least until skeletal deformity.

Section B : Quality Domains

B1 Efficient

B1 a) Report of Actual v Planned activity

Statement of Activity 2011-12

	Actual	Agreed
Assessment	53	35
Tertiary new outpatient referrals	28	25
Admission for surgery	10	
ITU bed days	0	
HDU bed days	0	
Ward bed days	16	
Outpatient follow up appointments	212	

NHS Board of residence for referrals:

GG&Clyde patients
25 patients seen less than 3 times & discharged

Ayrshire and Arran	
Dumfries and Galloway	
Greater Glasgow & Clyde	41
GGHB& Clyde tertiary	16
Lanarkshire	
Lothian	
Tayside	
Western Isles	
	53
Total tertiary referrals	28

NHS Board of residence for admissions:

Ayrshire & Arran	
Dumfries & Galloway	
Forth Valley	
Greater Glasgow & Clyde	
Lanarkshire	10

NHS Board of residence for patient appointments:	Ayrshire and Arran	9
	Borders	[redacted]
	Dumfries and Galloway	8
	Fife	8
	Forth Valley	7
	Greater Glasgow & Clyde	115
	Grampian	[redacted]
	Highland	
	Lanarkshire	28
	Lothian	22
	Tayside	[redacted]
	Western Isles	
		212

Referrals and Operation Numbers since 1997:

Year	Referrals	Surgical Procedures
1997	6	[redacted]
1998	[redacted]	[redacted]
1999	[redacted]	0
2000	14	[redacted]
2001	12	[redacted]
2002*	10	[redacted]
2003	23	8
2004	34	9
2005	24	[redacted]
2006 – 07	44	6
2007- 08	*39*	[redacted]
2007 (ter)	26	[redacted]
2008 – 09	*40*	*8*
2008 (ter)	36	8
2009 - 10	*38*	*7*
09-10 (ter)	25	7
2010 - 11	*35*	*8*
10-11 (ter)	26	8
11-12	53	10
11-12 (ter)	28	10
Total		**57**

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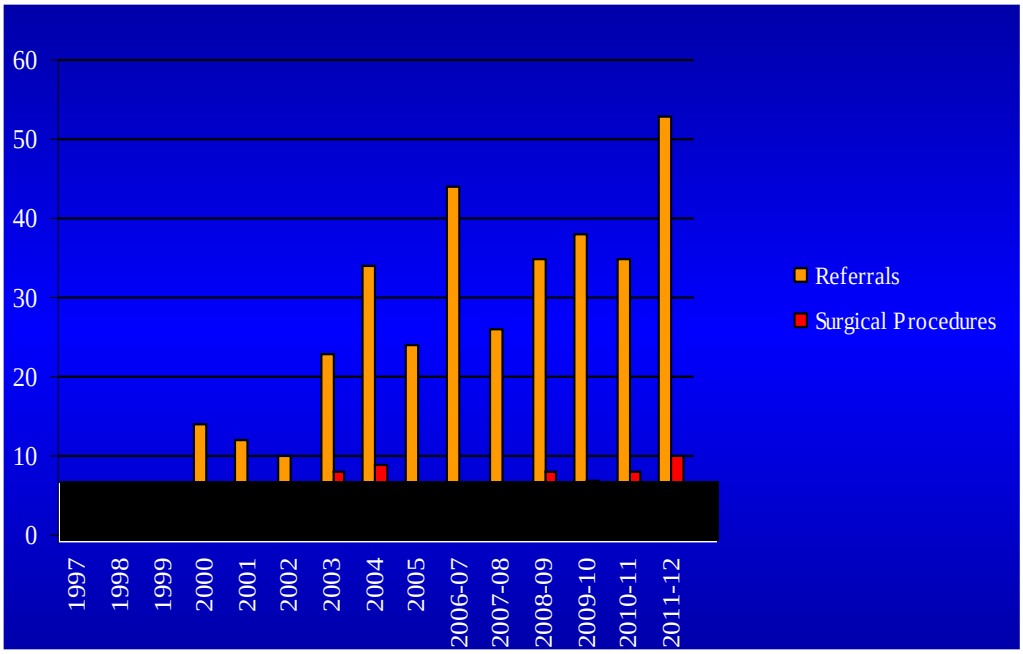
Activity Graph



B1 b) Resource use

Covered in other part of the report.

B1 c) Finance and Workforce

For 2011/12 the cost of the service was £110,814.

B1 d) Key Performance Indicators (KPIs) and HEAT targets

No KPIs agreed.

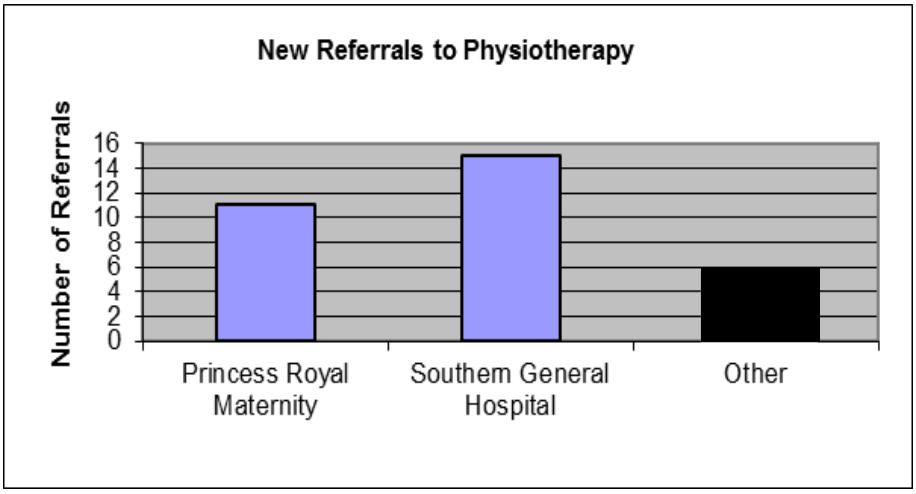
B2 Effective

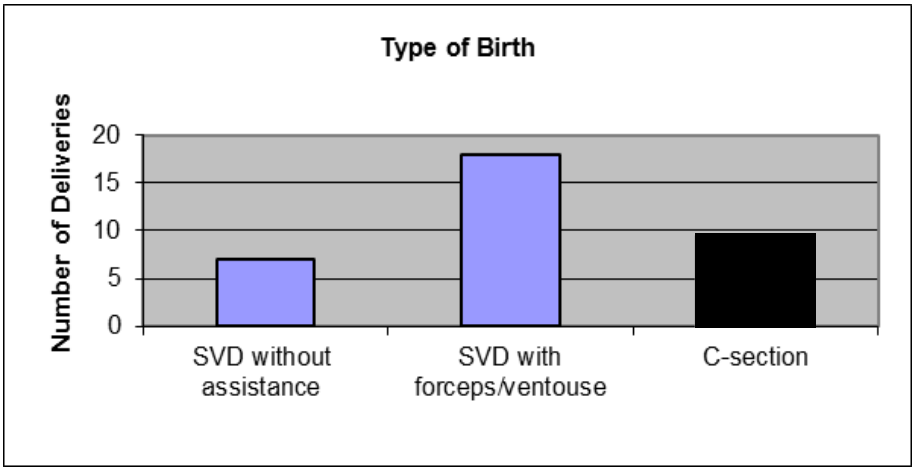
B2 a) Clinical Audit Programme

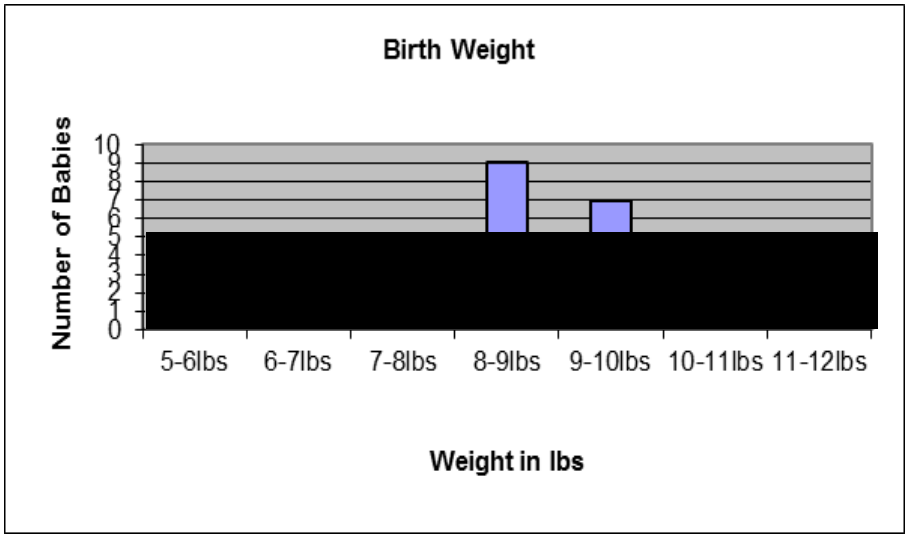
Physiotherapy

An audit of our new referrals in 2011 showed there were 28 babies born in Glasgow referred to physiotherapy with a brachial plexus palsy.

The results of the audit are displayed below.







OBPP Nerve Exploration / Repair Cases 2004 to 2011

Since the appointment of Professor Andy Hart in 2008, exploration of the brachial plexus has been included in the interventions the obstetric brachial plexus injury service is designated to provide. A few cases had been carried out before 2008 by Mr Tim Hems and Mr David Sherlock with the help of Professor Rolfe Birch, from the Royal National Orthopaedic Hospital. An audit has been started to monitor the operations for nerve exploration and repair carried out for obstetric brachial plexus injury in Glasgow. A medical student, Arthur Woo, on a special study module, assisted with collection of results.

All cases of OBPI should be considered for the appropriateness of nerve surgery, which is best determined by a specialist therapist and surgeon(s) experienced in the procedure and the outcomes achievable. It is internationally accepted that the majority of cases recover sufficiently with conservative management so as not to require nerve exploration. The main indication for nerve surgery is poor recovery of elbow flexion and shoulder movement by 3 to 4 months of age, particularly when combined with evidence of significant paralysis/paresis of the hand or wrist. The decision on surgery is best made at that age, since it is highly likely that when nerve repair is required, the outcome will relate inversely to age at the time of surgery.

Interpretation of the outcomes achieved is complicated by:

- The small number of cases.
- The variation in the extent and severity of the injuries, and timing of surgery.
- Follow up is too short to assess the final result in the cases carried out during the last 2 years.
- The series includes several operators.
- Children with co-existing morbidity that could directly impact upon outcome.
- The lack of a nationally or internationally accepted outcome measure for the child, or regarding parental psychological morbidity.

Nine cases ([redacted] male, [redacted] female) have been carried out between 2004 and 2011.

Timing of Operation

The mean age at operation was 6 months (Median = 5 months, Range 4 to 14 months). (The child who had operation at 14 months was born 3 months prematurely and was not fit for earlier intervention).

Classification

Cases were classified using the Narakas system:

Group 1 C5, 6. Biceps and deltoid paralysis.
Group 2 C5, 6, 7. Only the long finger flexors work.
Group 3 Whole plexus involved with slight finger flexion only.
Group 4 Whole plexus involved plus Horner's syndrome.

	Number
Group 1	[redacted]
Group 2	[redacted]
Group 3	0
Group 4	[redacted]

Indications:

In 6 cases the aim of the procedure was reconstruction for elbow flexion and shoulder elevation. In one of these the lesion was found to be recovering and no repair was carried out.
Nerve repair was performed for shoulder function in [redacted] patients and [redacted] for elbow flexion.

In [redacted] cases the aim of the procedure was reconstruction for shoulder elevation and external rotation only. In one of these the lesion was found to be recovering and no repair was carried out. Nerve repair was performed in [redacted] patients.

Method of Repair

Elbow flexion: Nerve grafting of the upper trunk of the brachial plexus.

Shoulder elevation: Reinnervation of the Suprascapular nerve was by transfer of the Accessory nerve in 6 of 7 cases and the dorsal scapular nerve graft in [redacted] case.

[redacted] children had release of shoulder contracture at the same time as nerve reconstruction which will also have affected the result for shoulder recovery.

Results

Elbow flexion:	failure	(No recovery)
	poor	(70^o flexion)
	satisfactory	(90^o flexion) (Follow up still < 2 years, so may improve)

Shoulder elevation:	poor
	satisfactory
	good
	excellent

Mean active shoulder elevation (Flexion or abduction) = 90^o (Range $50 – 140^o$)
Mean Mallet score (Scale of 5 to 25) = 13 (Range 5 – 19)

Complications

Overall the interventions appear safe.
In [redacted] phrenic nerve dysfunction was noted after operation. However, the phrenic nerve may be injured in association with OBPI, response to intra-operative stimulation was weak, and the [redacted] parents had noted asymmetrical chest excursion in early life. It is therefore likely that the condition had been present before surgery. In subsequent cases phrenic nerve function has been assessed before operation.
No significant scar or nerve-graft donor site problems have been encountered.

Conclusion

These early results appear satisfactory taking into account the severity of injuries being treated, and are favourable compared to the likely outcome of secondary reanimation procedures. The unit will continue to monitor new cases and longer term outcomes.

B2 b) Clinical Outcomes/ complication rates / external benchmarking

Covered in other part of the report.

B2 c) Service Improvement

Physiotherapy

During the year Heather Farish took over the role of Highly Specialist Physiotherapist for the service. Maggie Lang, who had been undertaking this role has left on maternity leave. We thank her for her contribution to the service.

Clinic Input

The highly specialist physiotherapist continues to be in attendance at all brachial plexus clinics to offer physiotherapy assessment and advice to patients who require input. We hold physiotherapy records for all patients who attend the clinic and communicate with community physiotherapists regarding their patients. This is done prior to and after each clinic to ensure any valuable information is passed on to the rest of the team prior to seeing the child. Feedback is then given to the community physiotherapist about the outcome of the clinic appointment by phone or by email and followed up with the clinic note. This approach has greatly improved communication links and continuity of care for brachial plexus palsy across Scotland.

Referrals

Outwith the clinic setting we continue to receive physiotherapy referrals for new babies who have suffered a brachial plexus palsy across Glasgow. We aim to see these babies within a week of birth and are normally the first point of contact for these families following discharge from the maternity hospital. We also see some of the older children who live in Glasgow for out patient appointments separate from their clinic appointments as required.

Young Adult Clinic

Some patients who are still followed up in the children's brachial plexus clinic are now age 16 or over. In addition some referrals are received for adults who have ongoing problems resulting from OBPI. It was felt inappropriate to continue to see these patients in the children's clinic. Therefore a new clinic for young adults has been started the first being held in April 2011. The clinic is at the New Victoria Hospital, Glasgow, the same location as the adult brachial plexus clinics. The clinical nurse specialist, occupational therapist, and physiotherapist who work with the adult service are contributing. The clinic is continuing on a twice yearly basis.

B2 d) Research

Tim Hems

As well as the existing project on the outcome of surgery for shoulder deformity in OBPI, Tim Hems with Terence Savaridas (Specialist registrar in Orthopaedics) have started a project to quantify elbow flexion strength in children who have had obstetric brachial plexus injury (OBPI). Although it is known that elbow flexion usually recovers to a functionally useful level after OBPI this has not be formally quantified.
The study involves measuring elbow flexion strength in children over the age of 5 attending the outpatient clinic using a hand held dynamometer. Ethical approval has been obtained and the study is continuing.

Publications

Sibinski M, Hems,T.E.J. Management Strategies for Shoulder Reconstruction in OBPI, with special reference to loss of internal rotation after surgery. *Journal of Hand Surgery: European Volume.* In press.

Andy Hart

A junior surgical trainee has been supervised in the following projects of relevance to brachial plexus injury:

- The psychological impact upon parents of having a child with Obstetric Brachial Plexus Palsy

A medical student has been supervised in the following projects of relevance to brachial plexus injury:

- Anatomy of the suprascapular nerve within the supraclavicular fossa

Ongoing basic science research into pharmacological neuroprotection strategies, and tissue engineered strategies for nerve repair are of direct relevance to OBPI.
Publication:

Terenghi G, Hart AM & Wiberg M **"The nerve injury and the dying neurons: diagnosis & prevention"** Journal of Hand Surgery (European) 2011, 36E, 730-4.

Presented:

"**Neuronal death & Adjuvant pharmacotherapy in the management of peripheral nerve trauma**" Hart A, The British Society for Surgery of the Hand, Autumn Meeting, Oct 2011

"Designing a Conduit for Peripheral Nerve Regeneration" Dejardin T, Martin C, Ross L, Knox A, Cumming D, Hart A & Riehle M. **ESB 2011**

El-Khayat B, Dalby M, Riehle M & Hart A **"Mechanical factors induce differentiation of human mesenchymal stem cells towards a glial phenotype"** Scottish Plastic Surgery meeting 2011

Dejardin T, Martin C, Ross L, Knox A, Cumming D, Hart A & Riehle M. **"Designing a Conduit for Peripheral Nerve Regeneration"** Tissue & Cell Engineering Society 2011

B3 Safe

B3 a) Risk Register

All healthcare professionals funded within the structure of the Obstetric Brachial Plexus Palsy Service meet Greater Glasgow & Clyde Trust requirements for vetting by Disclosure Scotland, and registration with the Information Commissioner's Office.
Miss Claire Murnaghan has certified level 3 Child Protection training.

B3 b) Clinical Governance

Patients reviewed, or treated at the RHSC Yorkhill site fall under the hospital's own governance system, reinforced by internal audit within the Orthopaedic, and the Plastic Surgery Services. No significant governance issues have been identified through these mechanisms during 2010-2011.

B3 c) Healthcare Associated Infection (HAI) and Scottish Patient Safety Programme (SPSP)

The outpatient clinic has fully adopted recommendations on hand hygiene, dress code, and cleaning of equipment as recommended nationally. These measures are also in full implementation within the inpatient ward, and theatre complex used. Regular monitoring of compliance within the hospital is performed by assessors independent to the Plexus Service. No peri-operative bacterial infections occurred during the period 2010-2011. One patient developed symptoms of viral gastroenteritis within 48 hours of discharge, but was felt to be community acquired on the temporal basis of symptoms in other family members not attending hospital.

B 3 d) Adverse Events

The service uses existing Greater Glasgow & Clyde thresholds for instigation of adverse event reporting and investigation, plus online reporting systems. No adverse events have been reported to occur during the period 2011-2012.

B 3 e) Complaints / Compliments

Complaints are handled by the Complaints Liaison Officer, as per the NHS Complaints Procedure. Information leaflets regarding the complaints policy are available from any member of staff at RHSC.

B4 Timely (Access)

B4 a) Waiting / Response Times

The mean time between referral and first consultation is 28 days (range 5 days to 88 days).

Most referrals are sent centrally Miss Murnaghan at RHSC by letter, fax or via the electronic vetting system for those who are not directly referred by the maternity units.
The urgency of the referral is graded when it is received. The response times have been appropriate to the condition of the patients. The longer delays were as a result of patients not attending the first appointment offered to them.

B4 b) Review of Clinical Pathway

(i) Review and Changes to Clinical Pathway

Insert text here

(ii) Improvements to Local Delivery of Care

Insert text here

B5 Person Centred

B5 a) Patient Carer/Public Involvement

Insert text here

B5 b) Better Together Programme Involvement

Insert text here

B5 c) User Surveys

None performed during the last year.

B6 Equitable

B6 a) Fair for all: Equality & Diversity

The Plexus service complies with NHS rules on equality & diversity in the appointment of staff. Similar care is taken in providing equal care standards to patients and relatives. Appropriate use of interpreters, and awareness of cultural, ethnic and religious practices in regard to examination and interaction with parents is facilitated.

B6 b) Geographical access

Outreach Clinics: In order to assess and follow-up patients from the North East of Scotland clinics were held at Woodend Hospital, Aberdeen in September 2011 and March 2012. Clinics are held approximately every 6 months depending on demand and seem well received by the patients. Adult brachial plexus patients and children are seen in the same clinic.
The need for clinics in other locations is under review.

Section C : Looking Ahead/Expected Change/Developments

Physiotherapy
Work is in progress on developing a physiotherapy information booklet for the brachial plexus palsy service to give parents a greater understanding of the importance of physiotherapy for their new baby. This booklet will also be available to community physiotherapy staff which will improve consistency of information.

We have also recently updated the Scottish National Brachial Plexus Service website www.brachialplexus.scot.nhs.uk with information on physiotherapy, how to access the service and up to date contact details.

Occupational Therapy

Some children with OBPI have benefited from referral to the Occupational Therapy Department at Yorkhill for assessment of the wider impact of their upper limb condition on their development Care includes outpatient assessment & care, liaison with local services, and outreach visits to schools, nurseries, and community services.
Following a proposal to NSD funding has been agreed for 0.3 WTE for a dedicated occupational therapist to support the service. It is hoped to move forward to make an appointment as soon as possible.

Psychological Support

It is recognised that parents and children with OBPI may require support and counselling at various points. Key focuses for intervention would be:

1) Assist with parents and families at point of diagnosis and to deal with birth issues
2) Help with parental anxiety relating to early surgical decisions, eg nerve exploration, open reduction of shoulders, botulinum toxin injections
3) Pre-school therapy
4) Starting school, development of body image and establishment of peer realtionships including perception by peers
5) Adolescence and psychosexual development
6) Career choices, driving and independent living

Currently, some children have been referred to the Department of Clinical Psychology but they have to wait on a common waiting list and so often the time-frame for intervention is longer than appropriate.
There is also an issue with equity of access nationally.
We hope to develop proposals for dedicated professional support for children with OBPI and their families and believe it is important that the person providing this has good knowledge of the condition.

Patient Information

The previously identified need to revise the parental information pack has been acted upon, but is progressing slower than predicted. Assistance from NSD was offered during the last meeting, and requires integration with the terms of parental information packs required by Yorkhill Hospital. Draft documentation has been prepared and is under review. It is expected to finalise content and formatting within the next 6 months.

Section D : Summary of Highlights (Celebration and Risk)

Activity of the Obstetric Brachial Plexus Injury Service has remained similar to previous years. During the last year important developments have been made in respect of physiotherapy, brachial plexus exploration and repair, ultrasound of the shoulder, development of secondary procedures for forearm rotation, and the young adult clinic.

The multidisciplinary team remains the basis of the success and ongoing development of the service. As well the work in the clinics, there has been considerable out-patient physiotherapy activity. In addition to those already mentioned in the report operating theatre staff have given skilled assistance in long cases.

Appendix

Teaching and Training Activity

Physiotherapy
Heather Farish provides an ongoing training programme for our rotational physiotherapy staff who have the opportunity to carry out joint assessments with the highly specialist physiotherapist of new babies who have a brachial plexus palsy. The rotational physiotherapists can also shadow the team members at the brachial plexus palsy clinic.
The physiotherapy musculoskeletal team also have a slot on the emergency department medical staff teaching rota and as part of that training we educate the rotational doctors on the correct management of babies with a brachial plexus palsy.
There is regular phone contact with community physiotherapy staff with regularly advice and support given regarding specific patients they have on their caseloads with brachial plexus palsy.

Claire Murnaghan

Talks to:
08/02/11 Lecture on Neonatal Brachial Plexus Palsy including means of referral, for the Obstetricians at the Southern General Hospital

22/10/11 Talk about Brachial plexus palsy to the Scottish Orthopaedic Practitioners course.
Preparing an article about Neonatal Brachial Plexus Palsy for their autumn journal (2012)

Tim Hems

12th April 2011	Edinburgh Hand Surgery Course. "Management of Brachial Plexus Injuries". Included OBPI.
11th June 2011	British and European Hand Surgery Instructional Course. Manchester. British Society for Surgery of the Hand. "Surgical reconstruction of the Shoulder after Obstetric Brachial Plexus palsy."

Andy Hart

Supervised 3 medical students on medical electives / Special Study modules, including focus upon OBPI. Lectured to the Glasgow University Surgical Society on microsurgery, including primary and secondary reconstructive options for OBPI.