

Proportion of children (%) with MP < 33% (green), 33 - 39% (yellow) and > 40% (red) in relation to GMFCS level.

Figure 5: Children with a Reimers migration index > 33% or > 40%, depending on the GMFCS level (from (Hägglund et al., 2007)).

In Switzerland, some pediatric orthopaedic surgeons have so far followed the hip traffic light model of the German CP network, but a Switzerland-wide registry for hip development in children with CP has not yet existed. Various parameters are already recorded in the Swiss Cerebral Palsy Registry (Swiss-CP-Reg) with the aim of improving the treatment and well-being of people with CP. This is now being expanded to include a Swiss "hip surveillance" program. The aim is to determine the status quo of hip-specific therapies in children with CP and their outcome and thus gain additional scientific knowledge in order to be able to improve hip-specific therapy in the future.

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Who is taking part?

The aim is to set up a Switzerland-wide registry. The data collection was initialized at the Department for Pediatric Orthopaedics and Traumatology at the University Children's Hospital Zurich. An extension to all pediatric orthopaedic centers in Switzerland who treat children with CP is already in progress.

Who includes the patients and what are the inclusion criteria?

As usual, children will be included in the Swiss cerebral palsy registry by the rehabilitation physician or the neuro-pediatrician. The pediatric orthopaedic surgeons are informed when a child has been included in the registry, so that hip surveillance can be initiated. In case the pediatric orthopaedic surgeons see a child who is not in the database the rehabilitation physician or the neuro-pediatrician is informed to include the child in the registry. The signed informed-consent form is a prerequisite for hip surveillance in the registry. The general informed consent for the Swiss CP Registry covers the hip surveillance section. It is aimed to include all children with CP.

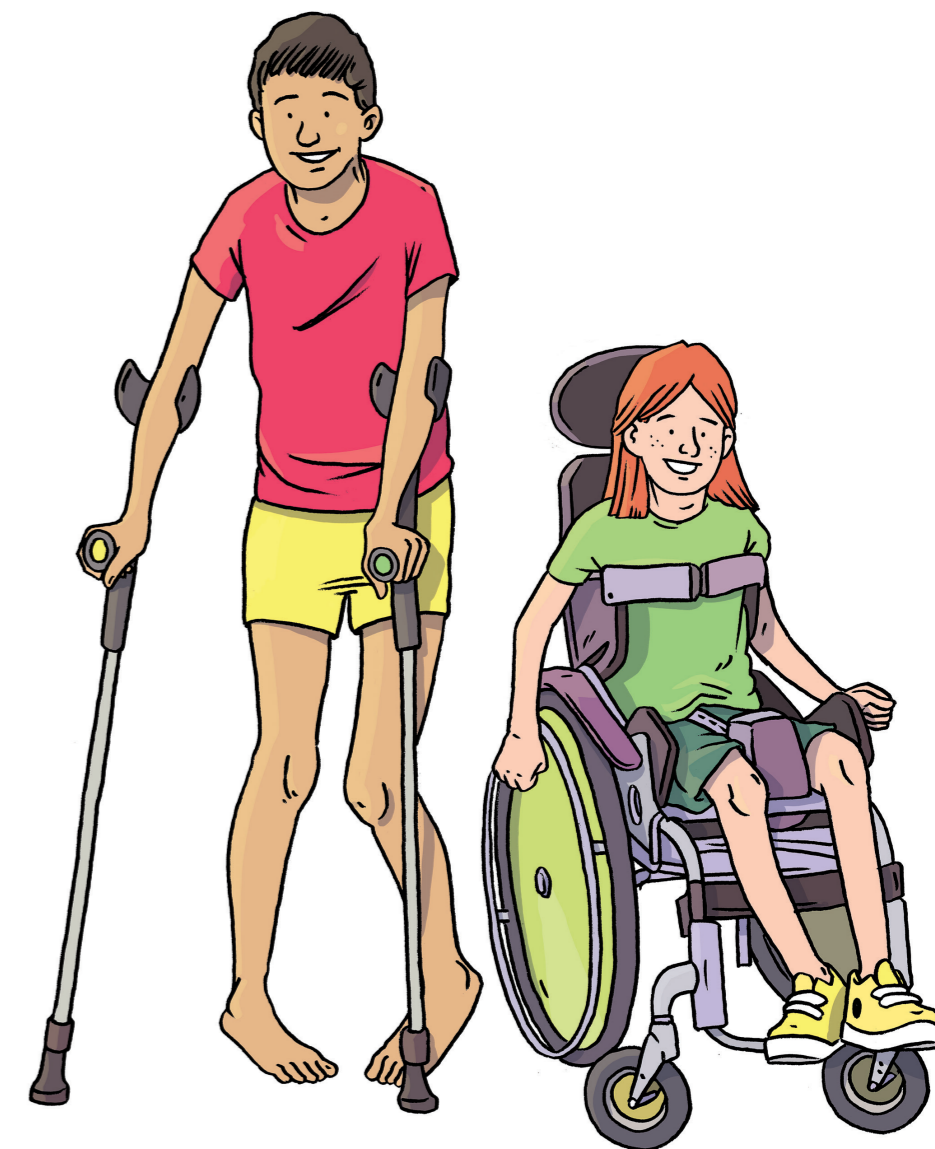
Which parameters are recorded in the "Hip surveillance" section of the Swiss Cerebral Palsy Registry?

- GMFCS level (as assessed at the time of the consultation)
- Type and frequency of physiotherapy
- Hip joint mobility: passive hip abduction ability measured in 0° and 90° flexion
- Femoral head overage in the a.p. pelvic radiograph: classic and modified migration index according to Reimers
- Conservative hip-specific therapies such as static abduction braces, dynamic standing and walking abduction orthoses, derotational bandages, Botulinum toxin or phenol injections.
- Hip-specific surgeries such as soft-tissue surgeries, femoral and pelvic osteotomies, open hip reduction or salvage.

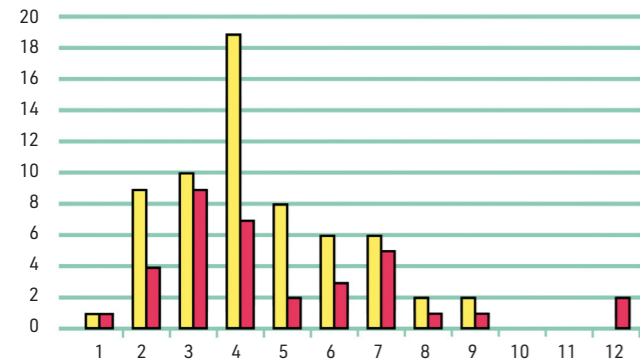
When is data for the "Hip surveillance" collected?

The "Hip surveillance" is recorded at the time of each consultation involving pediatric orthopaedic surgeons, but at least at the defined schedule according to the hip traffic light (i.e. annually or semi-annually, depending on the risk constellation according to the hip traffic light). The RedCap database will automatically send reminders when a new data collection is needed for a child.

Swiss CP Registry – Hip Surveillance



Hip joint pathologies are among the most common orthopedic sequelae in children with cerebral palsy (CP), with neurogenic hip dislocation being one of the main problems. The hip joints of children with CP are typically normal at birth. Due to the abnormal forces caused by muscle imbalances and the reduced / absent ability to walk, there is a secondary deformity and, as a result, increasing (sub)luxation of the hip joint. It is known from previous studies that the rate of hip joint dislocations in children with CP is around one third and often occurs as early as 3 – 4 years of age (see Figure 1).

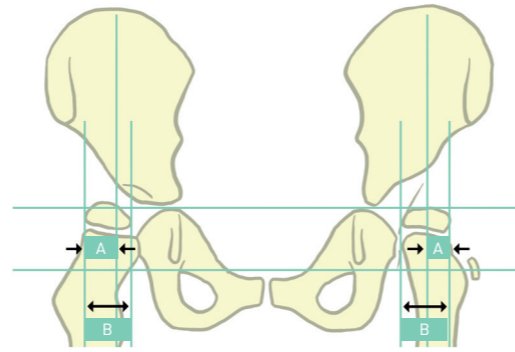


Number of Children related to age (years) at first registration of MP above 33 % (yellow) and 40 % (red)

Figure 1: Age when a migration index of 33% or 40% is exceeded for the first time (from (Hägglund et al., 2007))

Early detection of a hip “at risk” is important in order to be able to initiate appropriate therapy at an early stage. Hip dislocations are often painful and can lead to other problems such as contractures, progressive joint destruction, problems with hygiene, difficulties with sitting, bedsores and scoliosis. The ability to walk is also impaired in patients who are able to walk. An early surgical treatment of a hip “at risk” is also technically easier.

Regular radiological hip screening using a “hip traffic light” system can massively reduce the number of hip dislocations through early detection of decentration (subluxation). The assessment of the migration index according to Reimers (see Figure 2) is important for quantifying the coverage of the femoral head in the pelvic radiograph (Reimers, 1980). The quotient of the uncovered portion of the femoral head and the total femoral head width is calculated parallel to the Hilgenreiner line. Depending on the percentage of the coverage deficit, the assignment to the hip traffic light is made followed by different therapy or observation recommendations accordingly (see Figure 3). Migration index above 40 % is associated with a high risk of



Measurement of Migration Percentage (MP). $MP = A/B \times 100$. On the right hip with a “Gothic arch” formation of the lateral margin, the midpoint of the arch is used as reference point.

Figure 2: Migration index according to Reimers (from (Hägglund et al., 2007))



A.p. Pelvic radiograph showing a right hip coverage deficiency

	0 – 30 %	30 – 40 %	> 40 %
GMFCS Level I GMFCS Level II	every year	every year	every 6m or surgery
GMFCS Level III GMFCS Level IV GMFCS Level V	every year	every 6m	every 6m or surgery

Figure 3: “Hip traffic light” Consensus Switzerland

further hip dislocation and therefore surgical intervention is recommended (Hägglund et al., 2007), however for indication the individual situation of the child and its family is taking into account.

Achievement of the ability to stand and walk is of particular importance for physiological hip development. A direct connection between the GMFCS level (see figure 4) and the rate of hip dislocations has been proven (see figure 5). It is therefore important to monitor the hip, especially in cases with a higher GMFCS score.

Hip surveillance programs and registries on hip development in children with CP are already established in several countries and regions, for example in Sweden and Australia. It has been scientifically shown that hip surveillance programs can reduce the rate of hip dislocations.

	<p>GMFCS Level I Children walk at home, school, outdoors and in the community. They can climb stairs without the use of a railing. Children perform gross motor skills such as running and jumping, but speed, balance and coordination are limited.</p>
	<p>GMFCS Level II Children walk in most settings and climb stairs holding onto a railing. They may experience difficulty walking long distances and balancing on uneven terrain, inclines, in crowded areas or confined spaces. Children may walk with physical assistance, a handheld mobility device or used wheeled mobility over long distances. Children have only minimal ability to perform gross motor skills such as running and jumping.</p>
	<p>GMFCS Level III Children walk using a hand-held mobility device in most indoor settings. They may climb stairs holding onto a railing with supervision or assistance. Children use wheeled mobility when traveling long distances and may self-propel for shorter distances.</p>
	<p>GMFCS Level IV Children use methods of mobility that require physical assistance or powered mobility in most settings. They may walk for short distances at home with physical assistance or use powered mobility or a body support walker when positioned. At school, outdoors and in the community children are transported in a manual wheelchair or use powered mobility.</p>
	<p>GMFCS Level V Children are transported in a manual wheelchair in all settings. Children are limited in their ability to maintain antigravity head and trunk postures and control leg and arm movements.</p>

Figure 4: GMFCS level for children between the ages of 6 and 12 (according to (Palisano et al., 1997), figure from (Burns et al., n.d.))