

Topical review

## Science is not enough: The modern history of pediatric pain

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### 1. Introduction

The purpose of this topical review is to examine the key discoveries and events in the last half century that have advanced our understanding and management of pediatric pain. All histories are influenced by selection biases and this history is no different.

### 2. Children and adolescents suffer recurrent pain

The early modern scientific work on pediatric pain emanated mostly from postwar Europe and was focused on recurrent pains. The seminal work was by Vahlquist [25,26], and later by Bille [10] in Sweden. Vahlquist's research on pediatric headache in Stockholm and Bille's doctoral dissertation, a large-scale epidemiologic study of the children of Uppsala, laid the foundation for the many subsequent studies of migraine and other headaches in children and adolescents. Bille followed a smaller group of children with pronounced migraine for 40 years [11].

At about the same time, Apley [7] in Bristol, England published his groundbreaking epidemiological and etiological studies on recurrent abdominal pain. These studies still inform our understanding of this very common but still understudied disorder.

### 3. Differences in pain management between child and adult patients

One of the first influential North American studies of pain in child health was published in 1977 by 2 nurses, Eland and Anderson [13]. It was not a very well-designed study and was published as a book chapter in an obscure nursing book. They looked at the ordering and use of analgesics for 25 children between 4 and 8 years of age who were hospitalized for surgery. Twenty-one children were ordered analgesics, but only 12 were given them. Eighteen of the children were matched with adults with similar surgery. The adult sample was given 372 opioid analgesic doses and 299 nonopioid pain doses. Although the study used a small sample, questionable matching, and did not even measure pain, the extreme differences in pain management between child and adult patients were stunning. Eland and Anderson noted that only 33 scientific articles, most on pediatric recurrent abdominal pain, had been published up to that time. Despite the limitations, it

was a landmark study that caught the attention of the academic and nursing communities [13].

Two well-designed studies that showed similar, but less extreme, effects followed. Beyer [9], a nurse, led a team on postoperative analgesic ordering and use in cardiac surgery. Fifty children were compared with 50 adults receiving similar surgeries. The authors found that 6 children were the only patients not prescribed any analgesics. Children, overall, received less than half of the analgesic doses given to adults. Similarly, Schechter [22], a pediatrician, led a group that published a chart review of 90 children and 90 adults, randomly selected and matched for sex and diagnosis in 4 diagnostic categories (hernias, appendectomies, burns, and fractured femurs). Adults received an average of 2.2 doses of narcotics per day, whereas children received half this number. Again there was no measurement of pain in either study.

### 4. Stress responses of neonates following surgery

A series of studies undertaken by Anand, as part of his PhD, supported by a Rhodes Scholarship at Oxford and the John Radcliffe Hospital, focused on pain in neonates. Anand developed sophisticated methods of measuring stress responses using micro samples of blood [4]. He showed that term and preterm neonates mounted a major stress response following surgery with a minimal anesthetic strategy, the "Liverpool" technique. In a series of randomized trials, he compared the stress responses of neonates following surgery with full anesthesia vs the "Liverpool" technique, which was a standard intervention of that time. Anand won the 1986 Dr. Michael Blacow prize for his paper, "Should neonatologists be more concerned over the anesthetic management of preterm neonates subjected to ligation of patent ductus arteriosus?," judged to be the best paper by a trainee at the annual meeting of the British Paediatric Society [20]. The initial trial was published in *The Lancet* [5] in 1987.

### 5. Research on neonates receives public attention

This work was well received but attracted a great deal more prominence because of a vitriolic attack in a newspaper article in *Daily Mail*, Pain killer shock in babies' operations, (July 8, 1987) [12], accused Professor Aynsley-Green, the supervisor of the research, and Dr. Anand of experimenting on babies by withholding anesthetics. This situation was taken up in August 1987 by the All-Party Parliamentary Pro-Life Group, who issued a press release demanding that the General Medical Council investigate

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the experiments that had deprived babies of pain relief during surgery.

There was an immediate uproar in the press. The *Daily Mail* supported the All-Party Parliamentary Pro-Life Members of Parliament and castigated these experiments. Several prominent medical scientists responded, supporting the ethical and scientific probity of the studies and pointed out that Anand's research would save many babies from having unprotected pain. Suddenly, the public knew that some babies were not given anesthetic and that there were safe ways to anesthetize even very small babies. Neonatal pain became a part of the public discourse. Much to his credit, the head of the All-Party group, Sir Bernard Braine, apologized in 1988 for his error [6].

At about the same time that Anand was doing his studies in England, the story of Jill and Jeffrey Lawson was unfolding in the United States [16,17]. Jeffrey Lawson was born in February 1985, at 25–26 weeks gestational age, weighing 760 g. His Apgar scores were 3 and 7. He was transferred to the Washington National Children's Hospital because of his need for a repair of a patent ductus. His mother described his treatment in a published letter in the journal, *Birth*:

*"Jeffrey had holes cut on both sides of his neck, another cut in his right chest, an incision from his breastbone around to his backbone, his ribs pried apart, and an extra artery near his heart tied off. This was topped off with another hole cut in his left side. The operation lasted hours. Jeffrey was awake through it all. The anesthesiologist paralyzed him with Pavulon, a drug that left him unable to move, but totally conscious. When I questioned the anesthesiologist later she said Jeffrey was too sick to tolerate powerful anesthetics. Anyway, she said, it had never been demonstrated to her that premature babies feel pain."* [16].

Following the surgery, Jeffrey suffered shock, started to catabolize, and went into heart, kidney, and liver failure. He died 5 weeks later on March 31, 1985.

Jill Lawson heard from a friend that babies may not always receive anesthesia. She contacted the anesthetist for reassurance that Jeffrey had been anesthetized and was told that he had not and had received a muscle paralysis drug. She was shocked with the anesthetist's assertion that her son didn't need anesthesia. She spoke to her son's neonatologist, who was appalled by the lack of anesthesia and wrote a letter to Perinatal Press that was titled "Barbarism" [21].

Jill Lawson tried to get support for her position that babies should get pain control from dozens of governmental and nongovernmental agencies, to no avail. They declined to help her or supported the anesthetist's actions.

It was not until an article in the *Washington Post* on August 13, 1986 by Rovner [19] that the story of Jeffrey and Jill Lawson was told to the world. Rovner, a staff writer, interviewed several experts in the area for her article. She quoted Willis McGill, Chair Anesthesia, Children's Hospital National Medical Center, who asserted that there are risks with anesthesia and "it doesn't do any good to have a dead patient who doesn't feel pain" ([19], p. 7). Following the *Washington Post* article, there were many other features in the press about Lawson's efforts. These articles highlighted the inequity of conducting surgery on babies without anesthesia. Shortly thereafter, the American Society of Anesthesiologists [3] and the American Academy of Pediatrics [1] each produced statements on the appropriate use of analgesia in neonates.

## 6. How these key discoveries and events advanced the field of pediatric pain

Is the Eland and Anderson paper best conceived of as advocacy or as science? Is it a combination? Is there any doubt that the

attack on Anand and the subsequent publicity advanced the use of anesthesia and analgesia in infants? Jill Lawson's actions put pediatric pain in play. People discussed pain in infants around the breakfast table and the water cooler. Every mother knew that their babies felt pain. How could all doctors not know that commonly understood parental observation?

Guardiola and Baños [15] conducted a bibliometric study of pediatric pain studies published between 1981 and 1990 and found 2966 articles on pediatric pain. They noted sharp increases in publications in the 1980s. The same group [8] found that the mid-1980s was also the turning point in the dramatic increase in articles on pain in neonates. It was only after that explosion of interest and research in pediatric pain that textbooks on pediatric pain were possible [18,23].

The science of the movement of knowledge to action has begun to be understood [24], and although it can be conceptualized in an orderly way, in practice it is often a messy, disorderly phenomenon.

The modern field of pediatric pain was born out of a marriage of science and public concern. The science has and will continue to construct the knowledge base. However, the public concern and outcry, namely the attacks on Anand and the tireless advocacy of Jill Lawson, provided the engine to move change forward. The American Pain Society recognized Lawson's contribution by creating the Jeffrey Lawson Award for Advocacy in Children's Pain Relief [2]. Without the science, the public outcry would not have had a knowledge base. Without the public outcry, the knowledge would have languished for years before being adopted.

The public outcry that surrounded the coming of age of pediatric pain, the Lawson case in the US and the Anand case in the UK, was generated by nonscientists. Public outcry is not usually included as a tool to change clinical practice [14]. Universities, hospitals, and funding agencies increasingly use public relations strategies to promote public knowledge of research done by their scientists. The major goal is not to change clinical practice but to enhance the status of research and to enhance the institution's brand. However, professional associations such as the International Association for the Study of Pain engage in public advocacy campaigns. The voice of the concerned public is beginning to be heard. As yet there is no lay group that focuses specifically on pain in infants, children, and adolescents.

Public knowledge of inequities that might be corrected by scientific discoveries may spur acceptance and funding of changes in clinical practice in pain. But press releases are never going to be as effective as the gut-wrenching story of Jeffrey Lawson or the vitriolic attack on the integrity of Anand and Aynsley-Green. Science is not enough to move knowledge into practice.

## Conflict of interest statement

There are no conflicts of interest with this article.

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