



TECHNICAL REPORT

Male Circumcision

abstract

FREE

Male circumcision consists of the surgical removal of some, or all, of the foreskin (or prepuce) from the penis. It is one of the most common procedures in the world. In the United States, the procedure is commonly performed during the newborn period. In 2007, the American Academy of Pediatrics (AAP) convened a multidisciplinary workgroup of AAP members and other stakeholders to evaluate the evidence regarding male circumcision and update the AAP's 1999 recommendations in this area. The Task Force included AAP representatives from specialty areas as well as members of the AAP Board of Directors and liaisons representing the American Academy of Family Physicians, the American College of Obstetricians and Gynecologists, and the Centers for Disease Control and Prevention. The Task Force members identified selected topics relevant to male circumcision and conducted a critical review of peer-reviewed literature by using the American Heart Association's template for evidence evaluation.

Evaluation of current evidence indicates that the health benefits of newborn male circumcision outweigh the risks; furthermore, the benefits of newborn male circumcision justify access to this procedure for families who choose it. Specific benefits from male circumcision were identified for the prevention of urinary tract infections, acquisition of HIV, transmission of some sexually transmitted infections, and penile cancer. Male circumcision does not appear to adversely affect penile sexual function/sensitivity or sexual satisfaction. It is imperative that those providing circumcision are adequately trained and that both sterile techniques and effective pain management are used. Significant acute complications are rare. In general, untrained providers who perform circumcisions have more complications than well-trained providers who perform the procedure, regardless of whether the former are physicians, nurses, or traditional religious providers.

Parents are entitled to factually correct, nonbiased information about circumcision and should receive this information from clinicians before conception or early in pregnancy, which is when parents typically make circumcision decisions. Parents should determine what is in the best interest of their child. Physicians who counsel families about this decision should provide assistance by explaining the potential benefits and risks and ensuring that parents understand that circumcision is an elective procedure. The Task Force strongly recommends the creation, revision, and enhancement of educational materials to assist parents of male infants with the care of circumcised and uncircumcised penises. The Task Force also strongly recommends the development of educational materials for providers to enhance practitioners' competency in discussing circumcision's benefits and risks with parents.

The Task Force made the following recommendations:

TASK FORCE ON CIRCUMCISION

KEY WORD

circumcision

ABBREVIATIONS

AAFP—American Academy of Family Physicians
 AAP—American Academy of Pediatrics
 ACOG—American College of Obstetricians and Gynecologists
 BV—bacterial vaginosis
 CB—caudal block
 CDC—Centers for Disease Control and Prevention
 CDM—Charge Data Master
 CI—confidence interval
 DPNB—dorsal penile nerve block
 HPV—human papillomavirus
 HSV—herpes simplex virus
 IELT—Intravaginal Ejaculatory Latency Times
 MSM—men who have sex with men
 NHDS—National Hospital Discharge Survey
 NIS—National Inpatient Sample
 OR—odds ratio
 RCT—randomized controlled trial
 STI—sexually transmitted infection
 UTI—urinary tract infection

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- Evaluation of current evidence indicates that the health benefits of newborn male circumcision outweigh the risks, and the benefits of newborn male circumcision justify access to this procedure for those families who choose it.
- Parents are entitled to factually correct, nonbiased information about circumcision that should be provided before conception and early in pregnancy, when parents are most likely to be weighing the option of circumcision of a male child.
- Physicians counseling families about elective male circumcision should assist parents by explaining, in a nonbiased manner, the potential benefits and risks and by ensuring that they understand the elective nature of the procedure.
- Parents should weigh the health benefits and risks in light of their own religious, cultural, and personal preferences, as the medical benefits alone may not outweigh these other considerations for individual families.
- Parents of newborn boys should be instructed in the care of the penis, regardless of whether the newborn has been circumcised or not.
- Elective circumcision should be performed only if the infant's condition is stable and healthy.
- Male circumcision should be performed by trained and competent practitioners, by using sterile techniques and effective pain management.
- Analgesia is safe and effective in reducing the procedural pain associated with newborn circumcision; thus, adequate analgesia should be provided whenever newborn circumcision is performed.
 - Nonpharmacologic techniques (eg, positioning, sucrose pacifiers) alone are insufficient to prevent procedural and post-procedural pain and are not recommended as the sole method of analgesia. They should be used only as analgesic adjuncts to improve infant comfort during circumcision.
 - If used, topical creams may cause a higher incidence of skin irritation in low birth weight infants, compared with infants of normal weight; penile nerve block techniques should therefore be chosen for this group of newborns.
- Key professional organizations (AAP, the American Academy of Family Physicians, the American College of Obstetricians and Gynecologists, the American Society of Anesthesiologists, the American College of Nurse Midwives, and other midlevel clinicians such as nurse practitioners) should work collaboratively to:
 - Develop standards of trainee proficiency in the performance of anesthetic and procedure techniques, including suturing;
 - Teach the procedure and analgesic techniques during post-graduate training programs;
 - Develop educational materials for clinicians to enhance their own competency in discussing the benefits and risks of circumcision with parents;
 - Offer educational materials to assist parents of male infants with the care of both circumcised and uncircumcised penises.
- The preventive and public health benefits associated with newborn male circumcision warrant third-party reimbursement of the procedure.

The American College of Obstetricians and Gynecologists has endorsed this technical report. *Pediatrics* 2012;130:e756–e785

INTRODUCTION AND BACKGROUND

Statement of the Issue

The American Academy of Pediatrics' (AAP) statement on circumcision of the newborn penis was last issued in May 1999.¹ The *Circumcision Policy Statement* recognized the health benefits of circumcision but did not deem the procedure to be a medical necessity for the well-being of the child. Since that time, substantial contributions have been made to the peer-reviewed literature concerning circumcision of males and its possible benefits. For this reason, in 2007, the AAP formed a Task Force charged with reviewing current evidence on male circumcision and updating the policy on this procedure to provide guidance to AAP membership regarding the circumcision of newborn males.

The American College of Obstetricians and Gynecologists has endorsed this technical report.

Background

Male circumcision consists of the surgical removal of some, or all, of the foreskin (or prepuce) from the penis. It is one of the most common procedures in the world. In the United States, the procedure is most frequently performed during the newborn period. Elective circumcision performed soon after the newborn period is generally a result of deferral because of low birth weight or illness in the newborn. Circumcision after the newborn period is most commonly performed because of the infant's low birth weight or illness precluded newborn circumcision. Other infants are circumcised later in life because of the occurrence of tight phimosis and/or urinary tract infection (UTI).

The 3 most common operative methods of circumcision for the newborn male include: the Gomco clamp, the Plastibell device, and the Mogen clamp (or variations derived from the same

principle on which each of these devices is based). The elements that are common to the use of each of these devices to accomplish circumcision include the following: estimation of the amount of external skin to be removed; dilation of the preputial orifice so that the glans can be visualized to ensure that the glans itself is normal; bluntly freeing the inner preputial epithelium from the epithelium of the glans; placing the device (at times a dorsal slit is necessary to do so); leaving the device in situ long enough to produce hemostasis; and removal of the foreskin.

The extent of this practice in the United States has been estimated by various federally sponsored national surveys, each of which has its strengths and limitations; thus, multiple measures of circumcision prevalence and incidence are presented. There are large population measures of male circumcision in the United States, measuring either the occurrence (ie, incidence) of male circumcision among newborns or the existence of the circumcised state among representative samples of males in the United States at a particular period in time (ie, prevalence). The findings of these studies are qualitatively similar and consistently estimate the rate of male circumcision to range from 42% to 80% among various populations.²⁻⁶

A recent Centers for Disease Control and Prevention (CDC) study assessed trends in the incidence of in-hospital newborn male circumcision from 1999 to 2010 using 3 independent sources of discharge data on in-patient hospitalizations: the National Center for Health Statistics' National Hospital Discharge Survey (NHDS), the Agency for Healthcare Research and Quality's National Inpatient Sample (NIS), and the SDI Health's Charge Data Master (CDM).^{2,3} These sources were used to estimate the incidence of newborn male circumcision

in the first month of life. Overall from 1999 to 2010, the CDC's weighted analysis found that the approximate percentage of newborn US males who were circumcised was approximately 59.1% according to the NHDS, 57.8% according to the NIS, and 55.8% according to the CDM. The incidence of newborn male circumcision decreased over time in all 3 data sources: from 62.5% in 1999 to 56.9% in 2008 according to the NHDS; from 63.5% in 1999 to 56.3% in 2008 according to the NIS; and from 58.4% in 2001 to 54.7% in 2010 according to the CDM (Fig 1). A key limitation is that these incidence rates were derived from hospital-based surveys and do not include out-of-hospital circumcisions; thus, these data sources underestimate the actual rate of newborn male circumcision in the first month of life.

NIS

The NIS is a database of 5 to 8 million hospital inpatient stays drawn from states that participate in the Healthcare Cost and Utilization Project (HCUP). In 2008, these states comprised 95% of the US population. The NIS is used to track and analyze national trends in health care utilization, delivery, and outcomes via a 20% stratified sample of 1000 community hospitals. Weights are provided to calculate national estimates.⁴

The NIS indicates that circumcision was performed in 57% of male newborn hospitalizations between 1998 and 2005. NIS data from 1988 to 2008 indicate that the rate of circumcision performed during newborn male delivery hospitalizations increased significantly from 48% in 1988-1991, to 61% in 1997-2000,⁵ then declined from 61% to 56% in 2000-2008⁶ (Fig 1). Circumcision rates were highest in the Midwestern states (74%), followed by the Northeastern (67%) and Southern states (61%). The lowest circumcision

rates were found in the Western states (30%) (Table 1).³

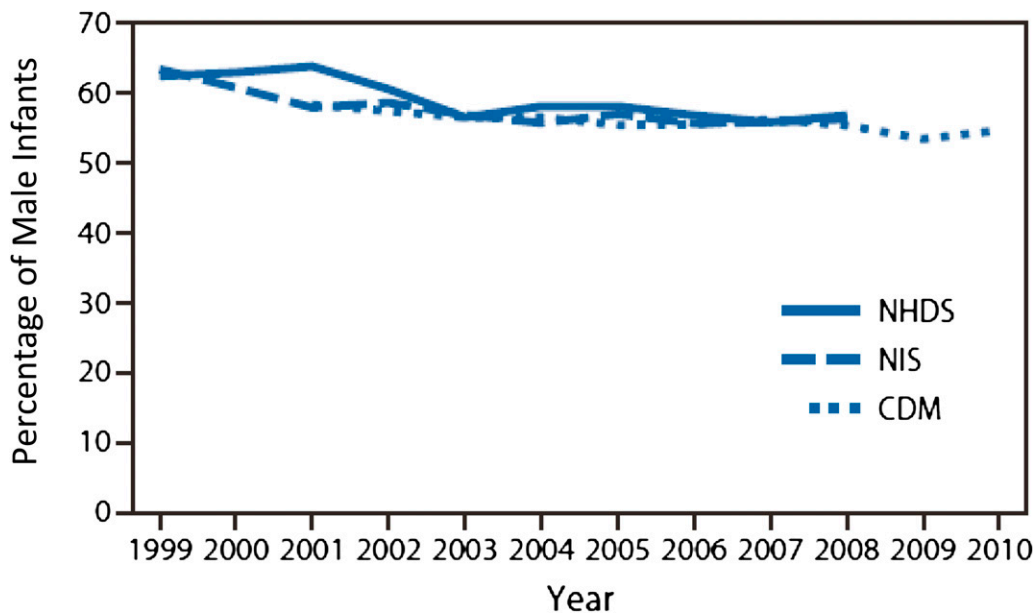
NHANES

The NHANES provides a snapshot of the health and nutritional status of the US population aged 14 to 59 years at the time of the survey, by using a probability sample of persons aged 0 to over 60 years. Prevalence of male circumcision is derived from participant self-report and is thus subject to misclassification. From 1999 to 2004, NHANES found that, of the 6174 men surveyed, 79% of men reported being circumcised, including 88% of non-Hispanic white men, 73% of non-Hispanic black men, 42% of Mexican-American men, and 50% of men of other races/ethnicities⁶ (Fig 2).

However, prevalence rates are limited by the accuracy of the examiner and/or the self-report.^{7,8} These findings underscore the necessity of using a standardized clinical examination for establishing circumcision status for the purpose of research on circumcision. It also highlights the potential difficulty of advising on care of the circumcised and uncircumcised penis when an individual and/or clinician may not know which condition is present.

Ethical Issues

The practice of medicine has long respected an adult's right to self-determination in health care decision-making. This principle has been operationalized through the doctrine of informed consent. The process of informed consent obligates the clinician to explain any procedure or treatment and to enumerate the risks, benefits, and alternatives so the patient can make an informed choice. As a general rule, minors in the United States are not considered competent to provide legally binding consent regarding their health care, and parents

**FIGURE 1**

Incidence of in-hospital newborn male circumcision, according to data source; United States, 1999–2010.^{2,3}

or guardians are empowered to make health care decisions on their behalf.⁹ In most situations, parents are granted wide latitude in terms of the decisions they make on behalf of their children, and the law has respected those decisions except where they are clearly contrary to the best interests of the child or place the child's health, well-being, or life at significant risk of serious harm.¹⁰

Parents and physicians each have an ethical duty to the child to attempt to secure the child's best interest and

well-being.¹¹ Reasonable people may disagree, however, as to what is in the best interest of any individual patient or how the potential medical benefits and potential medical harms of circumcision should be weighed against each other. This situation is further complicated by the fact that there are social, cultural, religious, and familial benefits and harms to be considered as well.¹² It is reasonable to take these nonmedical benefits and harms for an individual into consideration when making a decision about circumcision.¹³

In cases such as the decision to perform a circumcision in the newborn period (where there is reasonable disagreement about the balance between medical benefits and harms, where there are nonmedical benefits and harms that can result from a decision on whether to perform the procedure, and where the procedure is not essential to the child's immediate well-being), the parents should determine what is in the best interest of the child. In the pluralistic society of the United States, where parents are afforded wide authority for determining what constitutes appropriate child-rearing and child welfare, it is legitimate for the parents to take into account their own cultural, religious, and ethnic traditions, in addition to medical factors, when making this choice.¹¹

Physicians who counsel families about this decision should assist parents by objectively explaining the potential benefits and risks of circumcising their infant.¹⁰ Because some families may opt to circumcise as part of religious or traditional practice, discussion should also encompass risks and benefits of

TABLE 1 Multivariate Cox Proportional Hazards Regression of Selected Factors Associated With Circumcision Among Male Newborn Delivery Hospitalizations, United States, 1998–2005²

Characteristic	Weighted % of Male Infant Circumcisions	Adjusted Prevalence Rate Ratios (95% CI)
Hospital region		
Midwest	74	3.53 (3.23–3.87)
Northeast	67	2.90 (2.64–3.18)
South	61	2.80 (2.56–3.07)
West	30	1.00
Payer		
Private	67	1.76 (1.70–1.82)
Public	45	1.00
Hospital location		
Urban	66	1.29 (1.24–1.34)
Rural	56	1.00
Newborn health status		
Term, healthy	61	1.22 (1.20–1.23)
Not term, healthy	54	1.00

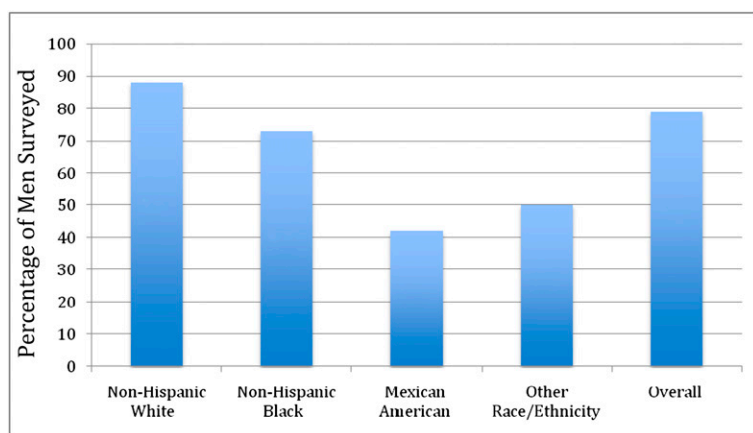


FIGURE 2 Prevalence of male circumcision, according to self-report; United States, 1999–2004.⁵

having a medical professional perform this procedure in a clinical setting versus having it performed by a traditional/religious provider in a nonmedical environment.

Parents may wish to consider whether the benefits of the procedure can be attained in equal measure if the procedure is delayed until the child is of sufficient age to provide his own informed consent. These interests include the medical benefits; the cultural and religious implications of being circumcised; and the fact that the procedure has the least surgical risk and the greatest accumulated health benefits if performed during the newborn period. Newborn males who are not circumcised at birth are much less likely to elect circumcision in adolescence or early adulthood. Parents who are considering deferring circumcision should be explicitly informed that circumcision performed later in life has increased risks and costs. Furthermore, deferral of the procedure also requires longer healing time than if performed during the newborn period and requires sexual abstinence during healing. Those who are already sexually active by the time they have the procedure lose some opportunities for the protective benefit against sexually transmitted infection (STI) acquisition,

including HIV; moreover, there is the risk of acquiring an STI if the individual is sexually active during the healing process. (See the section entitled Sexually Transmitted Diseases, Including HIV.)

Finally, there is a moral obligation to take reasonable steps to reduce the risk of harm associated with the performance of any surgical intervention. These include ensuring that the providers who perform circumcision have adequate training and demonstrate competence in performing the procedure; the provision of adequate procedural analgesia and postprocedural pain control; and that the risks of infection are minimized through appropriate infection control measures, such as a sterile environment and sterilized instruments.¹⁴ The Task Force advises against the practice of mouth-to-penis contact during circumcision, which is part of some religious practices, because it poses serious infectious risk to the child.

TASK FORCE ON MALE CIRCUMCISION

Committee Membership and Research Questions

In December 2007, the AAP formed a multidisciplinary workgroup of AAP

members and other stakeholders to evaluate the evidence on male circumcision and update the AAP's recommendations in this area. The Task Force included AAP representatives from specialty areas, including anesthesiology/pain management, bioethics, child health care financing, epidemiology, fetus and newborn medicine, infectious diseases (including pediatric AIDS), and urology. The Task Force also included members of the AAP Board of Directors and liaisons representing the American Academy of Family Physicians (AAFP), the American College of Obstetricians and Gynecologists (ACOG), and the CDC. The Task Force's evidence review was supplemented by an independent, AAP-contracted, physician and doctoral-level epidemiologist who was also part of the entire evidence review process.

Literature Search Overview

The Task Force members identified the following topics and questions as relevant to male circumcision and to be addressed through a critical review of the peer-reviewed literature:

- What is the current epidemiology of male circumcision in the United States?
- What are the most common procedures and techniques for newborn male circumcision?
- What best supports the parental decision-making process regarding circumcision?
- What is the association between male circumcision and both morbidity and sexual function/satisfaction?
- What is the impact of anesthesia and analgesia?
- What are the common complications and the complication rates associated with male circumcision?
- What workforce issues affect newborn male circumcision?

- What are the trends in financing and payment for elective circumcision?

The group agreed on parameters for reviewing the literature on associations between male circumcision and other outcomes. The literature review comprised analytic studies (including meta-analyses) in the topic areas in English-language, peer-reviewed, scientific literature. The Task Force evaluated studies that addressed the identified clinical questions, including all meta-analyses; all randomized controlled trials; and all case-control, prospective and retrospective cohort, and cross-sectional studies based on the American Heart Association's template for evidence evaluation (see the following section). Case reports, case series, ecological studies, reviews, and opinions were excluded from the review. Although case reports and case series are important for generating hypotheses, the Task Force limited itself to reviewing analytic studies. The Task Force compiled and vetted Medical Subject Headings, which are defined by the National Library of Medicine.

Searches were conducted in Medline, Cochrane Database, and Embase for the period 1995 through 2010. The literature search produced 1388 abstracts that were reviewed by both the epidemiologist and the Task Force chair, and those citations meeting the established criteria were included; ultimately, 1014 articles were included in the review (Table 2). A second search was conducted in April 2010, which yielded 42 additional citations, of which 17 were included. All 1031 accepted articles were reviewed by the contracted physician epidemiologist and at least 1 Task Force member; any differences were resolved by consensus. In 2011, individual Task Force members also identified other key articles that appeared in the peer-reviewed literature; these articles were consulted in

the preparation of the current report and cited accordingly. These additional articles did not affect the findings of the Task Force. Areas in which there were no analytic studies available for the time period of interest are noted as such within this document.

Evidence Quality and Use in Forming Recommendations

Articles were reviewed by using the American Heart Association's template for evidence evaluation.¹⁵ The articles were also assigned a level of evidence (Table 3) based on the methodology used. Among those with evidence levels 1 through 4, the reviewers assessed the quality of the evidence as "excellent," "good," "fair," or "poor" depending on how well the methodology was applied. Articles with an evidence level of 5 or higher were not included in this review. A critical assessment was made of each article/source in terms of the research design and methods, by using the American Heart Association's template (Table 4).

RESULTS

As a result of these findings, the Task Force made the following recommendations, which are described further in the following text:

- Evaluation of current evidence indicates that the health benefits of newborn male circumcision outweigh the risks, and the benefits of newborn male circumcision justify access to this procedure for those families who choose it.
- Parents are entitled to factually correct, nonbiased information about circumcision that should be provided before conception and early in pregnancy, when parents are most likely to be weighing the option of circumcision of a male child.
- Physicians counseling families about elective male circumcision should assist parents by explaining, in a nonbiased manner, the potential benefits and risks, and by ensuring that they understand the elective nature of the procedure.
- Parents should weigh the health benefits and risks in light of their own religious, cultural, and personal preferences, as the medical benefits alone may not outweigh these other considerations for individual families.
- Parents of newborn boys should be instructed in the care of the penis at the time of discharge from the newborn hospital stay, regardless of whether the newborn has been circumcised or not.
- Elective circumcision should be performed only if the infant's condition is stable and healthy.
- Male circumcision should be performed by trained and competent practitioners, by using sterile techniques and effective pain management.
- Analgesia is safe and effective in reducing the procedural pain associated with newborn circumcision; thus, adequate analgesia should be provided whenever newborn circumcision is performed.
 - Nonpharmacologic techniques (eg, positioning, sucrose pacifiers) alone are insufficient to prevent procedural and post-procedural pain and are not recommended as the sole method of analgesia. They should be used only as analgesic adjuncts to improve infant comfort during circumcision.
 - If used, topical creams may cause a higher incidence of skin irritation in low birth weight infants, compared with infants of normal weight; penile nerve block techniques should therefore be chosen for this group of newborns.

TABLE 2 Results from Medline, Cochrane Database, and Embase Search for 1995–2010

Clinical Topic Area ^a	No. of Articles Included
HIV/STI	231
Procedure and complications	219
UTI	53
Pain management	159
Penile dermatoses	107
Penile hygiene	76
Phimosis	64
Parental decision-making	60
Carcinoma (penile)	58
Carcinoma (cervical)	3
Sexual satisfaction	1

^a Does not include nonclinical areas such as ethics and financing.

- Key professional organizations (AAP, AAFP, ACOG, the American Society of Anesthesiologists, the American College of Nurse-Midwives, and other midlevel clinicians such as nurse practitioners) should work collaboratively to:
 - Develop standards of trainee proficiency in the performance of anesthetic and procedure techniques, including suturing;
 - Teach the procedure and analgesic techniques during postgraduate training programs;

TABLE 3 Evidence Levels

Level	Definition
1	RCTs or meta-analyses of multiple clinical trials with substantial treatment effects
2	RCTs with smaller or less significant treatment effects
3	Prospective, controlled, nonrandomized, cohort studies
4	Historic, nonrandomized, cohort or case-control studies
5	Case series: patients compiled in serial fashion, lacking a control group (excluded from review)
6	Animal studies or mechanical model studies (excluded from review)
7	Extrapolations from existing data collected for other purposes, theoretical analyses (excluded from review)
8	Rational conjecture (common sense); common practices accepted before evidence-based guidelines (excluded from review)

- Develop educational materials for clinicians to enhance practitioners' competency in discussing the benefits and risks of circumcision with parents;
- Offer educational materials to assist parents of male infants with the care of both circumcised and uncircumcised penises.
- The preventive and public health benefits associated with newborn male circumcision warrant third-party reimbursement of the procedure.

Parental Decision-Making

- Task Force Recommendations:
 - Parents are entitled to factually correct, nonbiased information about circumcision that should be provided before conception and early in pregnancy, when parents are most likely to be weighing the option of circumcision of a male child.
 - Physicians counseling families about elective male circumcision should assist parents by explaining, in a nonbiased manner, the potential benefits and risks, and by ensuring that they understand the elective nature of the procedure.
 - Parents should weigh the health benefits and risks in light of their own religious, cultural, and personal preferences, as the medical benefits alone may not outweigh these other considerations for individual families.

The decision of whether to circumcise a male newborn is frequently made early in the pregnancy and even before conception.^{16–18} In a cross-sectional study of parents of 55 male infants presenting to a family practice clinic for a well-child visit, 80% of parents

reported that the circumcision decision was made before a discussion occurred with the clinician about this issue. Only 4% of parents reportedly discussed circumcision with their clinician before the pregnancy.¹⁶ This finding is substantiated by the 2009 AAP survey of 1620 members with a response rate of 57%, in which most respondents reported that parents of newborn male patients generally do not seek their pediatrician's recommendation regarding circumcision; only 5% reported that "all" or "most" parents "are uncertain about circumcision and seek their recommendation" about the procedure.¹⁹ There is fair evidence that parental decisions about circumcision are shaped more by family and socio-cultural influences than by discussion with medical clinicians or by parental education.^{16,20}

In 4 cross-sectional studies with fair evidence, US parents most often reported that they chose to have their newborn son circumcised for health/medical benefits, including hygiene and cleanliness of the penis (reported by 39.6%, 46%, 53%, and 67%, respectively).^{16,17,21,22} Social concerns (such as having a father or brother who was circumcised) were also an important reason given for newborn male circumcision (22.8%, 23.5%, 28%, and 37%). Religious requirements for circumcision, such as those of the Jewish and Islamic faiths, were ranked less highly in importance (11%, 12.1%, 13%, and 19%). Although one of these studies was small and included only 55 patients drawn from a homogeneous population,¹⁶ the findings coincide with the 3 larger and more diverse studies.

For parents to receive nonbiased information about male circumcision in time to inform their decisions, clinicians need to provide this information at least before conception and/or early in the pregnancy, probably as a

TABLE 4 Assessment of Research Design and Methods

Component of Study and Rating	Excellent	Good	Fair	Poor	Unsatisfactory
Design and Methods	Highly appropriate sample or model, randomized, proper controls AND outstanding accuracy, precision, and data collection in its class	Highly appropriate sample or model, randomized, proper controls OR outstanding accuracy, precision, and data collection in its class	Adequate design but possibly biased OR adequate under the circumstances	Small or clearly biased population or model OR weakly defensible in its class, limited data or measures	Anecdotal, no controls, off target end points OR not defensible in its class, insufficient data or measures

curriculum item in childbirth classes. Information to assist in parental decision-making should be made available as early as possible. For this reason, obstetrician-gynecologists and family physicians who manage prenatal care probably have a more pivotal role in this decision than do pediatricians. *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*, Third Edition, supports prenatal pediatric visits, at which time pediatricians can provide counseling about male circumcision (<http://brightfutures.aap.org>). Medical benefits and risks need to be presented accurately and in a nonbiased fashion so families can make a decision in light of their own cultural, religious, and personal preferences.

There is fair evidence that there are financial barriers to the circumcision decision in the United States; when the procedure is not covered by insurance, parents are less likely to choose to have their child circumcised.²¹ This finding does not seem to be true in Canada, where the prevalence of circumcision did not change after circumcision for ritual, religious, cultural, or cosmetic reasons was delisted from insurance benefits in 1994.^{17,23}

Care of the Circumcised Versus Uncircumcised Penis

- Task Force Recommendations:
 - Parents of newborn boys should be instructed in the

care of the penis at the time of discharge from the newborn hospital stay, regardless of whether the newborn has been circumcised or not.

This review found no systematic studies in infants and children on the care of the uncircumcised versus circumcised penis.

Parents of newborn boys should be instructed in the care of the penis at the time of discharge from the newborn hospital stay, regardless of whether they choose circumcision or not. The circumcised penis should be washed gently without any aggressive pulling back of the skin.²⁴ The non-circumcised penis should be washed with soap and water. Most adhesions present at birth spontaneously resolve by age 2 to 4 months, and the foreskin should not be forcibly retracted. When these adhesions disappear physiologically (which occurs at an individual pace), the foreskin can be easily retracted, and the whole penis washed with soap and water.²⁵

Circumcision reduces the bacteria that accumulate under the prepuce which can cause UTIs and, in the adult male, can be a reservoir for bacteria that cause STIs. In an internally controlled study with fair evidence, researchers cultured the periurethral and glandular sulcus of 50 children aged 1 to 12 weeks before and 4 weeks after circumcision and found the pathogenic bacteria

largely disappeared after circumcision (33 children had pathogenic bacteria before circumcision and 4 had pathogenic bacteria after circumcision).²⁶

In adults and children, there is fair evidence that periurethral flora contains fewer pathogens after circumcision than before circumcision.^{26,27} Because these studies looked at cultures 1 time (4 weeks after the circumcision), the long-term significance of the findings is unclear.

Penile wetness (defined as the observation of a diffuse homogeneous film of moisture on the surface of the glans and coronal sulcus) is considered a marker for poor penile hygiene and is more prevalent in uncircumcised than in circumcised men.²⁸ Penile wetness has been associated with HIV infection in 1 cross-sectional study, although the temporal relationship is unclear and the evidence level is fair.²⁹ A related study with fair evidence assessed the frequency of washing the whole penis (including retracting the foreskin for uncircumcised men) and found that not always washing the whole penis was approximately 10 times more common in uncircumcised than in circumcised men.³⁰ The relationship between penile wetness and thorough washing of the penis is unclear and, because the studies were conducted in STI clinics, the findings may not be generalizable to the population at large.

Male Circumcision and Diseases, Morbidities, and Sexual Function/Satisfaction

STIs, Including HIV

- Task Force Recommendation:
 - Evaluation of the current evidence indicates that the health benefits of newborn male circumcision outweigh the risks, and the benefits of newborn male circumcision justify access to this procedure for those families who choose it.

The most notable research contributions to the literature since 1995 are studies of male circumcision and the acquisition of HIV and the transmission of other STIs. Review of the literature revealed a consistently reported protective effect of 40% to 60% for male circumcision in reducing the risk of HIV acquisition among heterosexual males in areas with high HIV prevalence due to heterosexual transmission (ie, Africa).

There is also good evidence from randomized controlled trials that male circumcision is associated with a lower prevalence of human papillomavirus (HPV) infection^{31,32} and herpes simplex virus type 2 (HSV-2) transmission,^{31,33} as well as a decreased likelihood of bacterial vaginosis (BV) in female partners.⁸⁰ The evidence for male circumcision being protective against syphilis is less strong,^{65–68} however, and male circumcision was not found to be associated with decreased risk of gonorrhea^{84,85,91–93} or chlamydia.^{84–89}

It is biologically plausible that the circumcised state may confer protection against STIs (including HIV). Possible mechanisms for the protective effect of circumcision include the fact that the foreskin's thin inner surface is susceptible to microtears and abrasions (especially during sexual activity), which provides a port of

entry for pathogens. The foreskin also contains a high density of HIV target cells (ie, Langerhans cells, CD4 T cells, macrophages), which facilitates HIV infection of host cells. The preputial space provides an environment that is thought to “trap” pathogens and bodily secretions and favor their survival and replication.^{26,27,34} The circumcised male has no foreskin and may likely provide a less welcoming environment for such substances. In addition, STI-containing secretions have increased contact time in the prospective uncircumcised male host, which may increase the likelihood of transmission and infection. The exposed surfaces of the uncircumcised penis do not offer the same physical barrier to resist infection that the highly keratinized surface of a circumcised penis does. Finally, the higher rates of sexually transmitted genital ulcerative disease (eg, HSV-2) observed in uncircumcised men may also increase susceptibility to HIV infection, as the presence of genital ulcers, irrespective of circumcision status, increases the likelihood of HIV acquisition.^{35–37}

HIV

The CDC estimates that 1.2 million people in the United States are living with HIV, the virus that causes AIDS, which is incurable. Approximately 50 000 Americans are newly infected with HIV each year; more than 619 000 people in the United States have died of AIDS since the epidemic began.³⁸ In the United States, HIV/AIDS predominantly affects men who have sex with men (MSM), who account for almost two-thirds (61%) of all new infections. Heterosexual exposure accounts for 27% of new HIV infections, and injection drug use accounts for 9% of new HIV cases. In other parts of the world (eg, Africa), heterosexual transmission is far more common.³⁹

Fourteen studies provide fair evidence that circumcision is protective against

heterosexually acquired HIV infection in men.^{40–53} One study with fair evidence found that male circumcision before puberty (specifically before 12 years of age) is more protective than circumcision occurring at a later age.⁵⁰ Three large randomized controlled trials provide good evidence of such protection.^{54–56} A cross-sectional study with fair evidence is neutral regarding the relationship between circumcision and HIV infection.⁵⁷ Two other studies with a cross-sectional design provide fair evidence that circumcision increases the risk of HIV infection, although one of these studies highlights the HIV risks associated with circumcision performed outside the hospital setting and without sterile equipment and medically trained personnel.^{58,59}

A recently published study from the CDC provides good evidence that, in the United States, male circumcision before the age of sexual debut would reduce HIV acquisition among heterosexual males.⁶⁰ Although individual sexual practices are difficult to predict in the newborn period, the majority of US males are heterosexual and could benefit from male circumcision. Mathematical modeling by the CDC shows that, taking an average efficacy of 60% from the African trials, and assuming the protective effect of circumcision applies only to heterosexually acquired HIV, there would be a 15.7% reduction in lifetime HIV risk for all males. This is taking into account the proportion of HIV that is acquired through heterosexual sex and reducing that by 60%. The percent reduction in HIV cases was determined by assessing the proportion of new cases of HIV infection that could be prevented by analyzing which infections would be presumed to occur in uncircumcised males and what the reduction would be if those who would not already be circumcised

would be circumcised. The proportions of transmissions prevented are lower than in Africa because a higher proportion of US HIV transmission occurs between MSM. In addition, a portion of the population would be circumcised without any policy change, and the prevented cases would only occur in the additional circumcised males. This ranges from an estimated 8% reduction in non-Hispanic white males to an estimated 21% reduction among non-Hispanic black males. The CDC study suggests that newborn circumcision performed in the United States to prevent HIV infection is cost-effective without consideration of other health benefits. The CDC recommendations state that all parents of newborn males should be given the choice of circumcision.

Specific HIV Risk Populations

MSM

The association of circumcision and the decreased likelihood of HIV acquisition applies to heterosexual males. Circumcision seems to be less likely to protect MSM, however, and has not been associated with decreased acquisition of HIV among MSM.⁶¹ There is fair evidence from 1 study that there is a protective effect of circumcision from HIV infection in MSM; however, this study used self-report to establish circumcision status.⁶² One study with fair evidence is neutral regarding the relationship between circumcision and HIV infection in MSM.⁶¹ It is probable that the differences found in the level of protection (or lack of protection) by studies of MSM are confounded by the fact that MSM commonly perform both receptive and insertive sex. It is not known to what extent circumcision may be protective against HIV transmission for MSM who practice insertive sex versus for those who engage in receptive sex.

Heterosexual Women

Women account for 23% of new HIV infections in the United States; HIV infection in women is primarily attributed either to heterosexual contact or injection drug use.³⁸ Two prospective cohort studies with fair evidence looked at the relationship between a woman's risk of HIV infection and whether her primary male partner is circumcised. The first study describes a protective effect but had considerable loss-to-follow-up and possible misclassification of the partners' circumcision status.⁶³ The other study showed nonsignificant protection in the high-risk group (ie, women who were more likely to have ever engaged in sex work; to have reported 2 or more partners in the last 3 months; and/or to have had a higher median lifetime number of sex partners) but neither protection nor increased risk in the study population as a whole.⁶⁴ A meta-analysis with good evidence of data from 1 randomized controlled trial (RCT) and 6 longitudinal analyses found little evidence that male circumcision directly reduces their female partner's risk of acquiring HIV (summary relative risk: 0.8 [95% confidence interval (CI): 0.53–1.36]); however, male circumcision's protective effect did not reach a level of statistical significance.⁶⁵ One Ugandan RCT study with good evidence found that, at 24 months, the risk of HIV infection among women whose male partners were circumcised was 21.7% compared with 13.4% for female partners of uncircumcised men.⁶⁶

Ulcerative STIs

Genital ulcers are notable both because of the morbidity and mortality associated with the causative organism and because the presence of the ulcer itself facilitates the transmission of HIV.

Syphilis

From 2009 to 2010, there were 13 604 cases of early latent syphilis reported

to the CDC and 18 079 cases of late and late latent syphilis. The rate of primary and secondary syphilis in 2010 was 4.5 cases per 100 000 individuals, 2.2% lower than the 2009 rate. "The total number of cases of syphilis (primary and secondary, early latent, late, late latent, and congenital) reported to CDC increased 2.2% (from 44,830 to 45,834 cases) during 2009–2010."⁶⁷ A large percentage of syphilis cases occur in MSM; in 2010, 67% of the reported primary and secondary syphilis cases were among MSM.⁶⁷

The balance of evidence suggests that male circumcision is protective against syphilis.^{68–70} One meta-analysis with good evidence describes a protective effect (relative risk: 0.67 [95% CI: 0.54–0.83]), but there is considerable heterogeneity among the studies included.⁶⁸ An additional cohort study with fair evidence found that circumcised men were significantly less likely to have active syphilis at the point of study recruitment; when the men were followed up prospectively for 2 years, a protective effect was also observed but was nonsignificant.⁶⁹ Good evidence from a large RCT reported no reduction or trend toward reduction for male circumcision and the incidence of syphilis⁷¹; however, the extent to which protection might be afforded, and among which specific populations, is difficult to determine.

Genital Herpes

Genital herpes is an STI commonly manifested by recurrent genital ulcers caused by HSV-1 or HSV-2. HSV may not be clinically evident despite infection. Approximately 16.2% of US individuals aged 14 to 49 years have HSV-2.^{51,72} Case reporting data for genital HSV are not available, but 2005–2008 NHANES data indicate that the percentage of NHANES participants aged 20 to 49 years who reported having

been diagnosed with genital herpes at some point was 18.9%.⁷²

One meta-analysis with good evidence found some protective effect of circumcision against HSV-2 of borderline statistical significance.⁶⁸ Good evidence of the protective effect of male circumcision is available from two of the large randomized controlled trials in Africa. In the South African study, the incidence of HSV-2 was 34% lower in circumcised men.⁷³ In the Uganda study, the risk of HSV-2 infection (adjusted for other factors) was 28% lower in circumcised men.⁷¹ There is fair evidence from 1 study that male circumcision protects female partners against HSV-2 infection.³³ Two studies with fair evidence found that there is no effect of circumcision on the risk of HSV-2 acquisition.^{6,74}

Chancroid

Chancroid is a bacterial disease spread through sexual contact. It is rare in the United States, with a total of 24 cases reported in 2010 (a rate of 0.08 case per 100 000 individuals).⁷⁵

The literature search produced no individual studies since 1995 exploring the relationship between male circumcision and chancroid. One meta-analysis with good evidence found that 6 of 7 older studies (85%) described circumcision as having a protective effect against chancroid. This meta-analysis did not provide a summary value for the relationship due to differences in the definition and ascertainment of outcomes and variability among the comparison groups.⁶⁸ One methodologically poor meta-analysis found no effect of male circumcision on chancroid.⁷⁶

Lymphogranuloma Venereum and Granuloma Inguinale (Donovanosis)

The CDC reports that the frequency of lymphogranuloma venereum infection is thought to be rare in industrialized

countries, although its identification is not always obvious; the number of cases of this infection in the United States is unknown.⁷⁷ Granuloma inguinale is a genital ulcerative disease that is rare in the United States but endemic in some tropical and developing areas. The lesions might develop secondary bacterial infection or can coexist with other sexually transmitted pathogens.

The literature search produced no studies since 1995 exploring the relationship between male circumcision and lymphogranuloma venereum or granuloma inguinale. One meta-analysis provided fair evidence that genital ulcerative disease was more common in uncircumcised men but not to a statistically significant degree.⁷⁸ One cross-sectional study with fair evidence found that male circumcision was protective against genital ulcers, but the findings were based on respondents self-reporting a history of genital ulcerative disease and may not be accurate.⁷⁹

Nonulcerative STIs

Nonulcerative STIs generally cause inflammation and scarring along the reproductive tract. Untreated infection can cause cancer, can interfere with reproduction, and can negatively impact newborn health. Additionally, these infections can facilitate the transmission of HIV.

BV

BV is a condition “in women where the normal balance of bacteria in the vagina is disrupted and replaced by an overgrowth of certain bacteria.”⁸⁰ BV is common among pregnant women; an estimated 1 080 000 pregnant women have BV annually.

There is good evidence from 1 large randomized controlled trial that male circumcision is protective against BV in female partners.⁸¹ A small prospective

cohort study with good evidence also found that male circumcision, among other factors, was protective against BV in female partners.⁸² A cross-sectional study with fair evidence found no effect but may have lacked the power to detect an effect.⁸³

Chlamydia

Chlamydia is the most commonly reported notifiable disease in the United States and the most common STI reported to the CDC, with 1 307 893 chlamydial infections (426.0 cases per 100 000 individuals) reported to the CDC in 2010.⁸⁴

The balance of evidence does not reveal any relationship between circumcision and chlamydia infection.^{85–87} The 1 prospective cohort study with fair evidence showed a protective effect, but the study had a composite endpoint with several STIs combined and used self-report of STI as the outcome (increasing the possibility of misclassification).⁸⁸ Two studies with fair evidence explored the effect of male circumcision on chlamydia infection in female partners. The first, a prospective cohort study, found a nonsignificant increased risk in the female partners of circumcised men.⁸⁹ The second, a cross-sectional study, found a significantly decreased risk of chlamydia infection among women with circumcised male sexual partners, but a possible selection bias may have affected results because only 51.8% of subjects had specimens for analysis.⁹⁰

Gonorrhea

Gonorrhea is the second most commonly reported STI in the United States, with 309 341 cases reported to the CDC (a rate of 100.8 cases per 100 000 individuals) in 2010.⁹¹

The evidence does not demonstrate any relationship between circumcision and gonorrheal infection.^{85,86,92–94} The

studies that show a protective effect are either barely significant or have poorly defined or self-reported outcomes, thus offering only a fair level of evidence.^{79,88}

HPV

HPV is among the most commonly occurring STIs in the United States and can lead to the development of cancers, including cervical cancer. The population-based data from NHANES 2003–2006 indicate that the overall prevalence of high- and low-oncogenic risk HPV types was 42.5% among US women aged 14 to 59 years. The prevalence of infection was lower for the 2 viral types with the highest risk of causing cancer, however, at 4.7% for HPV type 16 and 1.9% for HPV type 18.⁹⁵ There is good evidence that male circumcision is protective against all types of HPV infection (nononcogenic and oncogenic). Two prevalence studies with good evidence found a 30% to 40% reduction in risk of infection among circumcised men.^{96,97} These studies fail to provide information on the risk of acquiring HPV and may reflect persistence of HPV rather than acquisition of infection. Four studies provide fair evidence that male circumcision protects against HPV.^{98–101} The selection of anatomic sites sampled may influence the results.⁹⁸

Good evidence of the protective effect of male circumcision against HPV is available from two of the large randomized controlled trials in Africa. In the South African study, the prevalence of high-risk HPV was 32% lower in circumcised men.¹⁰² In the Uganda study, the risk of oncogenic HPV infection (adjusted for other factors) was 35% lower in circumcised men.⁷¹ There is also good evidence that male circumcision reduces the risk of male-to-female transmission of high-risk HPV from HIV-uninfected men. In the Uganda randomized controlled trial, the

prevalence of high-risk HPV infection was 28% lower in female partners of circumcised HIV-uninfected men, while the incidence was 23% lower.³² Good evidence from another Uganda randomized controlled trial of male circumcision in HIV-infected men indicates that a circumcision did not reduce the risk of male-to-female transmission of high-risk HPV from HIV-infected men.¹⁰³

Male Circumcision and UTIs

According to the CDC, “A urinary tract infection (UTI) is an infection involving any part of the urinary system, including urethra, bladder, ureters, and kidney.”¹⁰⁴ UTIs are the most common type of health care–associated infection reported to the National Healthcare Safety Network among US individuals. The majority of UTIs in males occur during the first year of life. In children, UTIs usually necessitate a physician visit and may involve the possibility of an invasive procedure and hospitalization.

Most available data were published before 1995 and consistently show an association between the lack of circumcision and increased risk of UTI. Studies published since 1995 have similar findings. There is good evidence from 2 well-conducted meta-analyses^{105,106} and a cohort study¹⁰⁷ that UTI incidence among boys under age 2 years is reduced in those who were circumcised compared with uncircumcised boys. The data from randomized controlled trials are limited. However, there are large cohort and case-controlled studies with similar findings. Given that the risk of UTI among this population is approximately 1%, the number needed to circumcise to prevent UTI is approximately 100. The benefits of male circumcision are, therefore, likely to be greater in boys at higher risk of UTI, such as male infants with underlying

anatomic defects such as reflux or recurrent UTIs.

There is fair evidence from 5 observational studies that UTI incidence among boys under age 2 years is reduced in circumcised infant boys, compared with uncircumcised boys under the age of 2.^{108–112} The degree of reduction is between threefold and 10-fold in all studies.

There is fair evidence from a prospective study that there is a decreased prevalence of uropathogens in the periurethral area 3 weeks after circumcision, compared with similar cultures taken at the time of circumcision.¹¹³ By using these rates and the increased risks suggested from the literature, it is estimated that 7 to 14 of 1000 uncircumcised male infants will develop a UTI during the first year of life, compared with 1 to 2 infants among 1000 circumcised male infants.

There is a biologically plausible explanation for the relationship between an intact foreskin and an increased association of UTI during infancy. Increased periurethral bacterial colonization may be a risk factor for UTI.¹¹⁴ During the first 6 months of life, there are more uropathogenic organisms around the urethral meatus of uncircumcised male infants than around those of circumcised male infants (this colonization decreases in both groups after the first 6 months).¹¹⁵ In addition, an experimental preparation found that uropathogenic bacteria adhered to, and readily colonized, the mucosal surface of the foreskin but did not adhere to the keratinized skin surface of the foreskin.¹¹⁶

Cancer

Penile Cancer

Penile cancer is rare, and rates seem to be declining. In the United States, Surveillance, Epidemiology, and End

Results data indicate that the incidence of primary, malignant penile cancer was 0.58 case per 100 000 individuals for 1993 to 2002, a decline from 0.84 case per 100 000 individuals from 1973 to 1982.¹¹⁷ An analysis of the Danish Cancer Registry found that the incidence of epidermoid cancer of the penis (excluding scrotal, epididymal, and nonepidermoid) declined from a rate of 1.15 cases per 100 000 individuals from 1943 to 1947 to 0.82 case per 100 000 individuals in 1988 to 1990.¹¹⁸

Thus, declines have been noted in nations with both low and high circumcision rates (Denmark and the United States, respectively). Declines are not explained by changing patterns in circumcision utilization; it is thought that socioeconomic and economic development factors (including effects on hygiene habits) may have an important role.

The literature review yielded 2 case-control studies; although the studies were well designed, the evidence level for case-control studies is only deemed to be fair.^{119,120} These studies show an association between circumcision and a decreased likelihood of invasive penile cancer. For all men with penile cancer (carcinoma in situ and squamous cell carcinoma), the absence of circumcision confers an increased risk with an odds ratio (OR) of 1.5, although this finding was not significant ($P = .07$), with a CI of 1.1–2.2.¹¹⁹ An OR indicates the odds of an event happening in 1 group divided by the odds of an event happening in another group. An OR of 1 thus means that there is an equal chance for the event to occur in each group. When separated into squamous cell carcinoma and carcinoma in situ, the absence of circumcision was a risk factor for invasive squamous cell carcinoma (OR: 2.3 [CI: 1.3–4.1]) but not for carcinoma in situ (OR: 1.1 [CI not provided]).

Phimosis is a condition in which the foreskin cannot be fully retracted from the penis. A history of phimosis alone confers a significantly elevated risk of invasive cancer (OR: 11.4). In fact, in men with an intact prepuce and no phimosis, there is a decreased risk of invasive penile cancer (OR: 0.5). When excluding phimosis, the risk disappears, which suggests that the benefit of circumcision is conferred by reducing the risk of phimosis and that the phimosis is responsible for the increased risk. Other forms of penile injury or irritation likewise can pose a significant risk factor for cancer. There is accumulating evidence that circumcised men have a lower prevalence of oncogenic (high-risk) and nononcogenic (low-risk) HPV when compared with uncircumcised men, and this may be another means by which circumcision has a protective effect against invasive penile cancer (as discussed in the earlier STI section).

It is difficult to establish how many male circumcisions it would take to prevent a case of penile cancer, and at what cost economically and physically. One study with good evidence estimates that based on having to do 909 circumcisions to prevent 1 penile cancer event, 2 complications would be expected for every penile cancer event avoided.¹²¹ However, another study with fair evidence estimates that more than 322 000 newborn circumcisions are required to prevent 1 penile cancer event per year.¹²² This would translate into 644 complications per cancer event, by using the most favorable rate of complications, including rare but significant complications.¹²³ The clinical value of the modest risk reduction from circumcision for a rare cancer is difficult to measure against the potential for complications from the procedure. In addition, these findings are likely to decrease with increasing rates of HPV vaccination in the United States.

Cervical Cancer

Up to 12 000 new cases of cervical cancer are diagnosed in the United States annually. Cervical cancer is a leading cause of death for women in developing countries; more than 80% of all cervical cancer deaths occur in developing countries.¹²⁴ Persistent HPV infection with high-risk (ie, oncogenic) types (HPV types 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 68, 73, and 82) is the main prerequisite to developing cervical squamous carcinoma.

The association of cervical cancer, penile HPV infection, and circumcision was studied in an article of fair quality that found a protective effect of male circumcision against cervical cancer in the female partner(s) of men who have multiple female partners.¹⁰⁰ There was a lower incidence of HPV detection in circumcised men compared with uncircumcised men (5.5% and 19.6%, respectively). The OR for men who self-reported having been circumcised and who had penile HPV was 0.37 (95% CI: 0.16–0.85). In women whose partner had more than 6 lifetime sexual partners, male circumcision lowered her odds of cervical cancer significantly (OR: 0.42). The overall rate of cervical cancer for women who currently had circumcised male partners was not significantly decreased. Thus, the contribution of male circumcision to prevention of cervical cancer is likely to be small.

Penile Dermatoses and Phimosis

Penile dermatoses encompass a wide range of genital skin diseases, some of which are rarer than others. These diseases can include psoriasis, inflammation (ie, balanitis, balanoposthitis), infections (ie, superficial skin and soft tissue infections such as cellulitis), lichen sclerosis, lichen planus, lichen simplex, seborrheic dermatitis, atopic

eczema, and irritant dermatitis, among others.

From 1995 to 2011, all publications addressing this concern were case series and were therefore excluded from the literature forming the current analysis. Before 1995, a New Zealand prospective cohort study with good evidence explored rates of penile problems for 635 boys from birth to 8 years of age.¹²⁵ Four types of penile problems were defined: first was the number of episodes of inflammation of the penis experienced by the child. Penile inflammation included balanitis, meatitis, inflammation of the prepuce, and conditions in which the penis was described as sore or inflamed without any further diagnostic elaboration. The second type was the number of episodes of phimosis experienced by the child. These episodes included every time medical attention was sought for phimosis and associated symptoms. Episodes in which the child was brought to medical attention for “tight” or “non-retractable” foreskin but was not treated were not classified as phimosis, due to the likelihood that most of these attendances resulted from parental anxiety or uncertainty about the development of the foreskin rather than any pathologic condition in the child. The third type was inadequate circumcision requiring repair or recircumcision. Fourth was postoperative infection after circumcision from birth to 8 years of age by circumcision status. Findings were inconclusive for the first year of life; the adjusted rate of problems experienced was 5.2 penile problems per 100 circumcised boys over the study period, compared with 1.2 penile problems in uncircumcised boys at risk. From ages 1 through 8 years, the rates were 6.5 penile problems per 100 circumcised boys over the study period, compared with 17.2 penile problems per 100 uncircumcised boys.

Sexual Function and Penile Sexual Sensitivity

The literature review does not support the belief that male circumcision adversely affects penile sexual function or sensitivity, or sexual satisfaction, regardless of how these factors are defined.

Sexual Satisfaction and Sensitivity

Literature since 1995 includes 2 good-quality randomized controlled trials that evaluated the effect of adult circumcision on sexual satisfaction and sensitivity in Uganda and Kenya, respectively.^{126,127} Among 5000 Ugandan participants, circumcised men reported significantly less pain on intercourse than uncircumcised men.¹²⁶ At 2 years' postcircumcision, sexual satisfaction had increased significantly from baseline measures in the control group (from 98% at baseline to 99.9%); satisfaction levels remained stable among the circumcised men (98.5% at baseline, 98.4% 2 years after the procedure). This study included no measures of time to ejaculation or sensory changes on the penis. In the Kenyan study (which had a nearly identical design and similar results), 64% of circumcised men reported much greater penile sensitivity postcircumcision.¹²⁷ At the 2-year follow-up, 55% of circumcised men reported having an easier time reaching orgasm than they had precircumcision, although the findings did not reach statistical significance. The studies' limitation is that the outcomes of interest were subjective, self-reported measures rather than objective measures.

Other studies in the area of function, sensation, and satisfaction have been less rigorous in design, and they fail to provide evidence that the circumcised penis has decreased sensitivity compared with the uncircumcised penis. There is both good and fair evidence that no statistically significant differ-

ences exist between circumcised and uncircumcised men in terms of sexual sensation and satisfaction.^{128–131} Sensation end points in these studies included subjective touch and pain sensation, response to the International Index of Erectile Function, the Brief Male Sexual Function Inventory, pudendal nerve evoked potentials, and Intravaginal Ejaculatory Latency Times (IELTs).

There is fair evidence that men circumcised as adults demonstrate a higher threshold for light touch sensitivity with a static monofilament compared with uncircumcised men; these findings failed to attain statistical significance for most locations on the penis, however, and it is unclear that sensitivity to static monofilament (as opposed to dynamic stimulus) has any relevance to sexual satisfaction.¹³² There is fair evidence from a cross-sectional study of Korean men of decreased masturbatory pleasure after adult circumcision.¹³³

Sexual Function

There is both good and fair evidence that sexual function is not adversely affected in circumcised men compared with uncircumcised men.^{131,134–136} There is fair evidence that no significant difference exists between circumcised and uncircumcised men in terms of sexual function, as assessed by using the IELT.¹²⁹

Limitations to consider with respect to this issue include the timing of IELT studies after circumcision, because studies of sexual function at 12 weeks postcircumcision by using IELT measures may not accurately reflect sexual function at a later period. Also, the self-report of circumcision status may impact study validity. This could be in an unpredictable direction, although it is most likely that the effect would be to cause an underestimation of the association. Other biases include

participants' ages and any coexisting medical conditions.

Analgesia and Anesthesia

- Task Force Recommendation:
 - Trained and competent practitioners, by using sterile techniques and effective pain management, should perform male circumcision. Analgesia is safe and effective in reducing the procedural pain associated with newborn circumcision; thus, adequate analgesia should be provided whenever newborn circumcision is performed.
 - Nonpharmacologic techniques (eg, positioning, sucrose pacifiers) alone are insufficient to prevent procedural and post-procedural pain and are not recommended as the sole method of analgesia. They should be used only as analgesic adjuncts to improve infant comfort during circumcision.
 - If used, topical creams may cause a higher incidence of skin irritation in low birth weight infants, compared with infants of normal weight, so penile nerve block techniques should be chosen for this group of newborns.

The analgesics used for newborn circumcision include nonpharmacologic and pharmacologic (topical and nerve blocks) techniques. The Task Force's review included nonnutritive sucking, a pacifier dipped in sucrose, acetaminophen, topical 4% lidocaine (ie, LMX4 cream), a eutectic mixture of lidocaine-prilocaine local anesthetic (EMLA), subcutaneous ring block, and the dorsal penile nerve block (DPNB). These methods, which reduce the pain and stress of newborn circumcision, are representative of the principles discussed in the AAP

Policy Statement on Prevention and Management of Pain in the Neonate, which was updated in 2006.^{137,138} There are no evidence-based recommendations that state there is persistent pain that must be treated after the local preprocedure anesthetic wears off.

Analgesia is safe and effective in reducing the procedural pain associated with newborn circumcision, as indicated by changes in heart rate, oxygen saturation, facial action, crying, and other measures.^{139–145} Therefore, adequate analgesia should be provided when newborn circumcision is performed. Topical 4% lidocaine, DPNB, and a subcutaneous ring block are all effective options, although the latter may provide the most effective analgesia. In addition there is good evidence that infants circumcised without analgesia exhibit a stronger behavioral pain response to subsequent routine immunization at 4 to 6 months of age, compared with both infants circumcised with analgesia and with uncircumcised infants.¹⁴⁵

The literature search did not produce any reports of local anesthetic toxicity, such as seizures or cardiovascular instability, among the newborns receiving either local anesthetic injections or topical applications (ie, topical 4% lidocaine).

Nonpharmacologic Techniques

There is good evidence that oral sucrose and oral analgesics are not different from placebo or environmental modification in their ability to control pain.^{141,142,144} There is good evidence that a more physiologic positioning of the infant in a padded environment may decrease distress during the procedure.¹⁴⁶ There is fair evidence that sucrose on a pacifier has been demonstrated to be more effective than water alone for decreasing crying during circumcision.^{147–149} Nonpharmacologic techniques alone are

insufficient to prevent procedural pain, however. Positioning and a sucrose pacifier should be used as analgesic adjuncts to improve infant comfort during circumcision but are not recommended as the sole method of analgesia.

Topical Local Anesthesia Techniques

There is good evidence that topical anesthesia with lidocaine-prilocaine (which contains 2.5% lidocaine and 2.5% prilocaine) or 4% lidocaine is superior to no anesthesia in preventing pain during male circumcision.¹⁵⁰

There is good evidence from a prospective cohort study that lidocaine-prilocaine cream attenuates the pain response to circumcision (as measured by using heart rate, oxygen saturation, facial actions, and time and characteristics of crying) when applied 60 to 90 minutes before the procedure.^{150,151} There is fair evidence from an RCT that lidocaine-prilocaine cream attenuates the pain response to circumcision, although it was less effective in doing so than DPNB or ring block.¹⁵² There is good evidence that topical 4% lidocaine is as effective as lidocaine-prilocaine at preventing pain.^{140,153} Topical 4% lidocaine has the advantage of having a faster onset of action (2 g applied 30 minutes before circumcision, compared with 1 to 2 hours before circumcision for lidocaine-prilocaine). Both topical preparations require coverage with plastic wrap to keep the cream in place. Topical 4% lidocaine is the preferred topical local anesthetic (over lidocaine-prilocaine) because there is no risk of methemoglobinemia.

The most common complications reported with analgesic techniques were an 8% to 14% incidence of erythema, swelling, and blistering associated with topical analgesia.^{142,150,153,154} There is fair evidence that adverse effects of topical anesthetic creams are

infrequent and include only either minor skin reactions (ie, erythema, swelling) or, more rarely, blistering (especially in low birth weight infants).¹⁵⁴ For this reason, penile nerve block techniques should be chosen for low birth weight infants. There is good and fair evidence that both reactions are less common with 4% lidocaine than with lidocaine-prilocaine cream.^{142,150,153–155}

There is a theoretical risk of methemoglobinemia with lidocaine-prilocaine.¹⁵² However, when methemoglobin has been measured after lidocaine-prilocaine application, the level, although elevated, was not clinically significant.¹⁵⁰ Nevertheless, there have been isolated case reports of clinically significant methemoglobinemia involving prolonged application time or use in premature infants.^{156,157,158}

DPNB

Most commonly, DPNB consists of injections of 0.4 mL of 1% lidocaine without epinephrine on both sides of the base of the penis. Systemic lidocaine levels obtained with use of this technique reached peak concentrations at 60 minutes after injection and were well below toxic ranges.¹⁵⁹

There is good evidence that DPNB is effective in reducing the behavioral and physiologic indicators of pain caused by circumcision, regardless of the device used.¹⁴⁴ There is good evidence that DPNB is superior to lidocaine-prilocaine in relieving pain during and after circumcision in newborns.^{142,160–162} One good-quality prospective cohort study of 491 newborn circumcisions measured complications of DPNB analgesia; it reported an 11% incidence of bruising and a 0.2% incidence of hematoma, none of which required any change in management.¹⁶³ Another good-quality, blinded, randomized controlled trial found a 43% incidence of small

hematomas in preterm and term newborns circumcised by using DPNB.¹⁴²

Subcutaneous Ring Block

Two studies with fair evidence found that the subcutaneous circumferential ring block (0.8 mL of 1% lidocaine without epinephrine injected at the base or midshaft of the penis) is effective in mitigating pain and its consequences during circumcision of newborns.¹⁶⁴

One study presented fair evidence that the ring block was superior to using no anesthesia but found a 5% failure rate with the technique (1 in 20 ring block infants had heart rate and behavioral pain scores that were above the control mean during at least 50% of the measured intervals, while 19 of 20 had heart rate and pain scores less than the control mean). There were no hematomas in the infants receiving ring blocks. A second ring block study had fair evidence that the method was superior to either DPNB or lidocaine-prilocaine cream for pain relief in newborn circumcision, as the ring block seemed to prevent crying and increases in heart rate during all phases of the circumcision, with less crying and lower heart rates during foreskin separation and incision than seen with DPNB or lidocaine-prilocaine.¹⁵² No complications have been reported in the use of this simple and highly effective technique.

Analgesia and Anesthesia for a Circumcision After the Newborn Period

In the United States, after the newborn period, general anesthesia is used during male circumcision because the surgical procedure takes longer and involves hemostasis and the suturing of skin edges. Use of adjuvant local anesthetic techniques in addition to general anesthesia provides longer-lasting postoperative analgesia, mini-

mizes the need for intraoperative or postoperative opioid administration, reduces adverse postoperative events such as nausea and vomiting, and decreases recovery time. Long-lasting analgesia is achieved with either penile nerve block, by using any of the methods mentioned earlier, or caudal epidural analgesia in infants and children up to 3 years of age.

General anesthesia carries a low risk of mortality (1 death per 400 000 instances of general anesthesia). The risk of adverse events (especially respiratory events) during general anesthesia remains higher in infants under 1 year of age.¹⁶⁵ These risks are minimized when the procedure is performed in infants in their optimal state of health (no active reactive airway disease or upper respiratory infection) and in a facility familiar with the anesthesia care of infants.¹⁶⁶ Additional concerns associated with surgical circumcision in older infants include time lost by parents and patients from work and/or school.

Caudal Block

Caudal block (CB) with bupivacaine is an anesthetic technique used for postoperative analgesia for circumcision in infants and older children up to 3 years of age, as an alternative to ring block and DPNB techniques. There is good and fair evidence that there is a longer time to first postoperative urination after CB without adverse clinical consequences.^{167,168} There is good evidence for a high incidence of mild postoperative motor block and delay in walking after the CB procedure (21% to 44%) in older children.^{167,169,170} Caudal analgesia may be less available in facilities that do not treat many pediatric patients.

DPNB

The reported failure rate of DPNB is 1% to 10%.^{171–175} When DPNB is used

without general anesthesia in boys 3 to 5 years of age, the technique has a failure rate of 15%; for boys aged 6 and older, the failure rate is 1.5%.¹⁷⁵ There is good and fair evidence that incidence of hematoma with DPNB ranges from 0.001% to 24%; several studies report rates of approximately 6%.^{174–177} One study with fair evidence reports a 0.001% rate of “improper needle position with bleeding” and a similar number of “medication errors.”¹⁷⁶ Studies with good and fair evidence report a 12% to 83% rate of edema in the area of injection of the local anesthetic after DPNB.^{174,175,177}

Subcutaneous Ring Block

There is good evidence for the reported 8% failure rate using the ring block.¹⁶⁸ In children, edema and distortion of tissue layers after the ring block make surgery more difficult, compared with using a CB to prevent postoperative pain.¹⁷⁸

Comparison of Methods

DPNB, subcutaneous ring block, and CB techniques may be used in conjunction with general anesthesia depending on the age of the child and are also used to provide post-circumcision analgesia. There is good evidence that there is no difference in the quality of postoperative analgesia or parent satisfaction between DPNB and CB using bupivacaine.¹⁶⁹ A comparison of CB with or without a subcutaneous ring block with bupivacaine showed good evidence that CB with a subcutaneous ring block had significantly longer duration of postoperative analgesia.¹⁶⁸ A technique describing ultrasound guidance for correct needle placement for DPNB in children under general anesthesia describes lower pain scores in the first postoperative hour and a longer interval until rescue analgesia was required.^{179,180}

Complications and Adverse Events

- Task Force Recommendation:
 - Elective circumcision should be performed only if the infant's condition is stable and healthy.
 - Male circumcision should be performed by trained and competent practitioners, by using sterile techniques and effective pain management.

The true incidence of complications after newborn circumcision is unknown, in part due to differing definitions of “complication” and differing standards for determining the timing of when a complication has occurred (ie, early or late). Adding to the confusion is the comingling of “early” complications, such as bleeding or infection, with “late” complications such as adhesions and meatal stenosis. Also, complication rates after an in-hospital procedure with trained personnel may be far different from those of the developing world and/or by untrained ritual providers. For the purposes of this document, complications are grouped in terms of the timing of the procedure. (Citations for the following statements below are provided in the section after this summary.)

Significant acute complications are rare, occurring in approximately 1 in 500 newborn male circumcisions. Acute complications are usually minor and most commonly involve bleeding, infection, or an imperfect amount of tissue removed. Late complications do occur, most commonly adhesions, skin bridges, and meatal stenosis. There are 2 schools of thought regarding the cause of penile adhesions, which are common after circumcision. One is that fine adhesions represent incomplete lysis of physiologic adhesions at the time of circumcision; the other is that the fine adhesions occur because of raw serosa surfaces. It is unknown how often these late

complications require surgical repair; this area requires further study.

In general, the specific technique used does not afford a significant difference in risk of complications. However, boys undergoing circumcisions in medical facilities in industrialized settings performed by trained practitioners have fewer complications than boys in nonindustrialized nations who have circumcisions performed by poorly trained (or untrained) practitioners in nonmedical surroundings. If circumcision is performed, it is imperative that those providing the service have adequate training in the method used and resources for and practice of adequate analgesia and infection control.

Contraindications to newborn circumcision include significantly premature infants, those with blood dyscrasias, individuals who have a family history of bleeding disorders, and those who have congenital abnormalities such as hypospadias, congenital chordee, or deficient shaft skin such as penoscrotal fusion or congenital buried penis. In addition, before performing newborn male circumcision, the clinician should confirm that vitamin K has been administered, in accordance with standard practice of newborn care.¹⁸¹

Newborn Elective Circumcision

Two large US hospital-based studies with good evidence estimate the risk of significant acute circumcision complications in the United States to be between 0.19% and 0.22%.^{121,123} Bleeding was the most common complication (0.08% to 0.18%), followed by infection (0.06%) and penile injury (0.04%). For comparison, an audit of 33 921 tonsillectomies found an incidence of hemorrhage of 1.9% among children aged 0 to 4 years.¹⁸² An Israeli prospective cohort study with fair evidence examined 19 478 male infants born in 2001 who were

circumcised primarily by trained, ritual providers in nonmedical settings, and reported similarly low complication rates. The overall complication rate was 0.34%, including bleeding in 0.08% and infection in 0.01%.¹⁸³ Approximately one-third of the identified complications were immediate (ie, bleeding, infection, penile injury), whereas two-thirds occurred later (ie, excess foreskin, penile torsion, shortage of skin, phimosis, inclusion cyst). There is fair evidence of a more frequent complication rate of 3.1% in a study based on abstraction of 1951 hospital medical (rather than billing) records on newborn circumcision in Atlanta.¹⁸⁴ In this study, complications were found to be much more common, with bleeding occurring in 2.1%, although most reports of bleeding were mild in nature. Likewise, a review with fair evidence of 1000 newborn circumcisions by using the Gomco clamp in a hospital setting in Saudi Arabia found an overall complication rate of 1.9%.¹⁸⁵ Bleeding occurred in 0.6%, infection in 0.4%, and redundant prepuce in 0.3%.

Late complications of newborn circumcision include excessive residual skin (incomplete circumcision), excessive skin removal, adhesions (natural and vascularized skin bridges), meatal stenosis, phimosis, and epithelial inclusion cysts. These complications are considered “late,” as opposed to “acute” (or immediate) complications such as bleeding or infection, which may still present during infancy but not during the immediate postprocedural time frame. In 1 outpatient-based study of 214 boys with poor evidence, the complications seen included adhesions (observed in 55 boys [25.6%]), redundant residual prepuce (44 boys [20.1%]), balanitis (34 boys [15.5%]), skin bridge (9 boys [4.1%]), and meatal stenosis (1 boy [0.5%]).⁷⁶

Outside the United States, a cross-sectional study from Nigeria of 370 consecutive male infants (322 of whom had been circumcised) attending an infant welfare clinic for immunization with fair evidence reported an overall complication rate of 20.2%.¹⁸⁶ Complications included redundant prepuce (12.9%), excessive skin removal (5.9%), skin bridge (4.1%), and buried penis (0.4%). The majority of the procedures (81%) were performed in the hospital; 19% were performed at home. Nurses performed 56% of procedures ($n = 180$), physicians performed 35% ($n = 113$), and traditional circumcisers performed 9% ($n = 29$). The Israeli study noted earlier with fair evidence reported a late complication of redundant prepuce in 0.2% of the 19 478 male infants studied.¹⁸³

There is good evidence that circumcision of a premature infant is associated with an increased risk of later-occurring complications (ie, poor cosmesis, increased risk of trapped penis, adhesions). There is also good evidence that circumcision of a newborn who has a prominent suprapubic fat pad or penoscrotal webbing has a higher risk for the same long-term complications.¹⁸⁷ One prospective study with fair evidence examined the natural course of penile adhesions after circumcision and found that adhesions disappeared at some point 6 months postcircumcision without intervention, except for thick adhesions (called “bridging adhesions”). The authors recommended lysis for skin bridges.¹⁸⁸

Post-newborn Circumcision

There have been few reports of acute complications after non-newborn circumcision in the United States. Furthermore, there are no adequate studies of late complications in boys undergoing circumcision in the

post-newborn period; this area requires more study.

Although adverse outcomes are rare among non-newborn circumcisions, the incidence tends to be orders of magnitude greater for boys circumcised between 1 and 10 years of age, compared with those circumcised as newborns.¹⁸⁹ As noted, general anesthesia, which is used for procedures performed after the newborn period, confers additional risk.

The most common surgical complication is excessive bleeding (eg, bleeding that did not stop with local pressure, perhaps requiring a suture), reported in 0.6% of 1742 male infants.¹⁸⁴ Contact burns were reported with electrocautery when used with metal, and it should not be used with the Gomco clamp in newborn circumcisions because it can cause devastating burns.^{184,190,191} A study with fair evidence reviewed the records of 476 boys undergoing circumcision during childhood and found that complications occurred in 8 records (1.7%), of which 3 were related to anesthesia.¹⁹² The most common surgical complication was excessive bleeding in 0.6%. In another report with fair evidence, which examined 267 patients who had circumcision by using topical glue rather than skin sutures, excessive bleeding occurred in 0.75% of cases.¹⁹³

European centers report an overall complication rate of 1.2% to 3.8% for circumcisions performed in boys during the newborn or non-newborn period.^{194–196} In a study with fair evidence of trained medical personnel in the United Kingdom, the rate of bleeding was 0.8% and of infection was 0.3%. In this study of a historical cohort of over 75 boys aged 0 to 14 years, 0.5% required surgical repair.¹⁹⁵

In a Turkish prospective cohort study of 700 boys with fair evidence, bleeding

was reported in 2.2% of cases and infection in 1.3% of boys circumcised in a hospital, versus a bleeding rate of 3.6% and an infection rate of 2.7% in boys undergoing a nonhospital-based mass religious procedure, despite the latter procedure being performed by trained personnel.¹⁹⁶

There are no adequate analytic studies of late complications in boys undergoing circumcision in the post-newborn period. An Iranian cross-sectional study with good evidence reported a late complication rate of 7.4%, including redundant skin in 3.6%, excessive skin removal in 1.3%, and meatal stenosis in 0.9%.¹⁹⁷

Major Complications

The majority of severe or even catastrophic injuries are so infrequent as to be reported as case reports (and were therefore excluded from this literature review). These rare complications include glans or penile amputation,^{198–206} transmission of herpes simplex after mouth-to-penis contact by a mohel (Jewish ritual circumcisers) after circumcision,^{207–209} methicillin-resistant *Staphylococcus aureus* infection,²¹⁰ urethral cutaneous fistula,²¹¹ glans ischemia,²¹² and death.²¹³

Medical Versus Traditional Providers

In general, untrained providers create more complications when performing male circumcision than do well-trained providers, regardless of whether they are physicians, nurses, or traditional religious providers. Physicians in a hospital setting generally have fewer complications than traditional providers in the community setting.

A prospective study in Kenya with good evidence found an overall complication rate of 35% in 443 children and young men aged 5 to 21 years who had traditional circumcision performed in

a village or household setting, compared with an overall complication rate of 17% in those whose circumcision was performed by trained providers in a medical setting such as a hospital, health center, or physician's office.²¹⁴ The most common complications were bleeding and infection; excessive pain, lacerations, torsion, and erectile dysfunction were also observed. A study in Turkey with fair evidence studied a historical cohort and found a significantly higher rate of complications when male circumcision was performed by traditional circumcisers, compared with those performed by physicians; complication rates were 85% for traditional providers versus 2.6% for physicians.²¹⁵

A study in Israel with fair evidence found there was no difference in the rate of complications in newborn circumcision between hospital-based physicians and well-trained, home-based ritual circumcisers (mohels).¹⁸³

Complications With Different Methods of Male Circumcision

There have been few studies comparing the 3 most commonly used techniques for male circumcision in the United States (the Gomco clamp, the Plastibell device, and the Mogen clamp). Steps common to all 3 include estimation of the amount of external skin to be removed; dilation of the preputial orifice so the glans can be visualized to ensure that the glans itself is normal; bluntly freeing the inner preputial epithelium from the epithelium of the glans; placing the device; leaving the device in place long enough to produce hemostasis; and surgically removing the foreskin.

Gomco Clamp

The Gomco clamp was specifically designed for performing circumcisions. In this procedure, "the foreskin is cut lengthwise through the stretched tissue (dorsal slit) to allow

space to insert the circumcision device. The bell of the Gomco clamp is placed over the glans, and the foreskin is pulled over the bell. The base of the Gomco clamp is placed over the bell, and the Gomco clamp's arm is fitted. After the surgeon confirms correct fitting and placement (and the amount of foreskin to be excised), the nut on the Gomco clamp is tightened and left in place for 3 to 5 minutes to allow hemostasis to occur, then the foreskin is removed using a scalpel. The Gomco's base and bell are then removed."²¹⁶

One study of the Gomco clamp with fair evidence reviewed 1000 newborn circumcisions in a hospital setting in Saudi Arabia and found an overall complication rate of 1.9%.¹⁸⁵ Bleeding occurred in 0.6% of cases, infection in 0.4%, and redundant prepuce in 0.3%. Another study of 521 newborn male circumcisions performed at a Houston outpatient clinic with fair evidence reported a 2.9% incidence of phimosis (trapped penis) after newborn circumcision using the Gomco clamp.²¹⁷

Plastibell Device

Plastibell circumcision involves a surgical procedure in which a plastic ring is inserted under the foreskin, and a tie is placed over the ring to provide hemostasis. The ring remains on the penis for several days until the tissue necroses and the ring falls off spontaneously. Bleeding ranged from 0.8% to 3% of cases; infection occurred in 2.1% of cases.²¹⁸ Urinary retention^{219,220} and problems with the Plastibell ring have been reported in 3.6% of cases.²²¹ Studies of the Plastibell device with fair and good evidence found, overall, that complications range from 2.4% to 5%.^{218,221–223}

Mogen Clamp

The Mogen clamp is a device consisting of 2 flat blades that have a limited

(slit-like) space between them and a mechanism that draws the blades together and locks them in place. The slit is limited to 3 mm to allow the foreskin, but not the glans, to cross the opening. The preputial adhesions are gently taken down by a probe and the glans pushed downward, thereby protecting it from the blades. The prepuce distal to the glans is drawn into the slit between the blades and positioned. The blades are locked together, crushing the skin and creating hemostasis. The skin is excised from above the clamp. The clamp is removed and the skin pushed proximally into proper position.

There were no specific studies of complications of the Mogen because complications are rare; thus, one can only rely on available case reports of amputation.^{201,202,222–228}

Comparison

A study with fair evidence evaluated the use of the Gomco versus the Plastibell device in 350 newborn infants.²²⁹ The incidence of infection was higher with the Gomco clamp (2%) versus a lower complication rate (1.3%) with the Plastibell device. Adhesions were also more common with the Gomco clamp, at a rate of 20% vs 6.6% for the Plastibell device.

Stratification of Risks

Based on the data reviewed, it is difficult, if not impossible, to adequately assess the total impact of complications, because the data are scant and inconsistent regarding the severity of complications. For example, studies that report bleeding as a complication do not uniformly report how frequently the bleeding was controlled with local measures versus requiring a transfusion or surgical intervention. Similarly, infection is rarely further divided into local tissue infection versus bacteremia or

sepsis. Financial costs of care, emotional tolls, or the need for future corrective surgery (with the attendant anesthetic risks, family stress, and expense) are unknown.

Some reports have attempted to compare potential benefits of circumcision with reported complication rates. One study with good evidence attempted to estimate complication rates compared with benefits from male circumcision. Based on an estimate that 100 circumcisions must be performed to prevent 1 UTI, and 909 circumcisions must be performed to prevent 1 case of penile cancer, the study yields an estimate of 1 complication for every 5 UTIs prevented and 2 complications for every 1 case of penile cancer prevented.¹²¹ Assuming an overall minor adverse event rate for newborn circumcision of 0.2%, and a severe adverse event rate of 0.005%, another study with fair evidence estimated that over 322 000 newborn male circumcisions are required to prevent 1 case of penile cancer per year.¹²² Similar modeling for HIV, herpes, and HPV in the United States is not available.

A recently published CDC study found that male circumcision before the age of sexual debut was cost-effective for the prevention of HIV.⁶⁰ The study did not take into account the positive benefits of newborn circumcision for other conditions such as costs of caring for UTIs.^{106,107,110,112,230–233} It also did not include recent evidence that circumcision (either as an infant or later in life) is associated with reduced risk for other STIs, penile and cervical cancers, phimosis, and penile dermatoses.^{36,88,234,235} The authors did not include adverse effects that make newborn circumcision less cost-effective, such as bleeding, infection, and revision. Considering all these factors, however, the authors concluded that male

circumcision was a cost-effective strategy for HIV prevention in the United States.⁶⁰

Workforce Development and Male Circumcision

- Task Force Recommendations:
 - Physicians counseling families about elective male circumcision should assist parents by explaining, in a nonbiased manner, the potential benefits and risks, and by ensuring that they understand the elective nature of the procedure.
 - Parents are entitled to factually correct, nonbiased information about circumcision that should be provided before conception and early in pregnancy, when parents are most likely to be weighing the option of circumcision of a male child.
 - Parents of newborn boys should be instructed in the care of the penis at the time of discharge from the newborn hospital stay, regardless of whether the newborn is circumcised or not.
 - Male circumcision should be performed by trained and competent practitioners, by using sterile techniques and effective pain management. Analgesia is safe and effective in reducing the procedural pain associated with newborn circumcision; thus, adequate analgesia should be provided whenever newborn circumcision is performed.
 - Key professional organizations (AAP, AAFP, ACOG, the American Society of Anesthesiologists, the American College of Nurse-Midwives, and other midlevel clinicians such as

nurse practitioners) should work collaboratively to:

- Develop standards of trainee proficiency in performance of anesthetic and procedure techniques, including suturing;
- Teach the procedure and analgesic techniques during postgraduate training programs;
- Develop educational materials for clinicians to enhance practitioners' competency in discussing the benefits and risks of circumcision with parents;
- Offer educational materials to assist parents of male infants with the care of both circumcised and uncircumcised penises.

Workforce Development and Parental Decision-making

There is fair evidence that some clinicians do not convey current or medically accurate information about circumcision to parents, either verbally or in written materials.¹⁸ Providing information about the risks and benefits of circumcision does not seem to lead to lower circumcision rates.²³⁶

Parents are entitled to factually correct, nonbiased information about circumcision and should receive this information from clinicians before conception and/or early in pregnancy, which is when they are making choices about circumcision. As noted, in 2009, the AAP surveyed members on their attitudes and practices around circumcision.¹⁹ According to the responses, 67% of pediatricians reported discussing the pros and cons of circumcision with parents. Almost two-thirds (62%) reported that they made no recommendation regarding circumcision to the majority of their patients; 18% responded recommending to all or most of their patients' parents that circumcision be

performed; 7% reported recommending to all or nearly all of the parents of newborn males that circumcision not be performed.

As described earlier, there is fair evidence that parental decision-making about circumcision tends to occur well before the child's birth. Thus, information to assist in parental decision-making should be made available as early as possible, even as part of guidance to parents before conception occurs. For this reason, obstetrician-gynecologists and family physicians who manage women's health and prenatal care probably have a more pivotal role in this decision than do pediatricians. Public health authorities have an important role in educating the public on the role of newborn male circumcision in disease prevention.

Workforce Development and Provision of Circumcision

In the United States, obstetricians, family physicians, and pediatricians are the principal clinicians who perform newborn circumcisions in medical settings; there is no single system of training or credentialing for circumcision in use nationwide.²³⁷ There is good and fair evidence of considerable variation in provider type by region and by hospital,^{238–240} with midwives performing circumcision in some locations.^{18,241}

Training curricula for teaching newborn circumcision in departments of pediatrics^{237,242} and family medicine²⁴³ have been described but do not provide information on how widely used they are or the trainings' results and/or effectiveness. One pediatric program's training consisted of the resident performing 3 to 5 circumcisions with assistance from a faculty instructor, 3 to 5 circumcisions under direct observation but without hands-on faculty involvement, and 2 test

circumcisions for grading and departmental credentialing.²⁴² The other 2 programs did not describe actual resident experience performing a circumcision.

Most residency training programs in the respective specialties teach techniques, including the Gomco clamp, Mogen clamp, and Plastibell device.²³⁸ As of 2006, 97% of programs that included training in performance of circumcision taught the use of either local or topical anesthetics for circumcision analgesia, an increase from 45% to 74% in 1998.^{238–240} Although case studies were excluded from this review, it was noted that 2 record reviews with fair evidence addressed the need for circumcision revision based on the medical discipline of the physician who performed the original procedure.^{241,244}

None of the articles reviewed addressed current or future workforce needs, which seems to depend on the number of surgeries being performed, the future demand, and reimbursement for the procedure. Sustaining a workforce that is capable of counseling families and performing the newborn male circumcision procedure safely is increasingly important, as the number of clinicians who are able to perform this procedure is likely to decline with curtailment of Medicaid coverage for it in various states.

The Task Force strongly recommends the creation, revision, and enhancement of educational materials to assist parents of male infants with the care of both circumcised and uncircumcised penises. The Task Force also strongly recommends the development of educational materials for clinicians to enhance practitioners' competency in discussing the benefits and risks of circumcision with parents. A structured decision-making tool that clinicians can use to help

parents complete would assist in the decision of whether to circumcise or not. To this end, the Task Force recommends that key professional organizations (AAP, ACOG, AAFP, American Society of Anesthesiologists, American College of Nurse-Midwives, and other entities supporting midlevel clinicians) work together to develop a consensus plan about which groups are best suited to perform circumcisions in newborn males; teach the procedure and analgesic techniques during postgraduate training programs; and develop standards of trainee proficiency. In addition, health departments should be involved in the dissemination of educational materials and coordinating educational efforts with professional organizations.

Financing Newborn Male Circumcision

- Task Force recommendation:

1. The preventive and public health benefits associated with newborn male circumcision warrant third-party reimbursement of the procedure.

The CDC estimates that, from 2005 to 2006, the average cost of providing newborn male circumcision (including physician- and facility-related costs) ranged from \$216 to \$601 across the nation.⁶⁰ Hospitals in states where Medicaid covers routine newborn male circumcision have circumcision rates that are 24% higher than hospitals in states without such coverage.²³ As of 2009, 15 states did not cover newborn male circumcision in their Medicaid programs; 2 additional states had variable coverage dependent on the enrollment plan.²⁴⁵ There seems to be a relationship between circumcision incidence and third-party payment.

Circumcised newborns are more likely to be privately insured than publicly insured infants.²⁴⁶ The weighted rates

of circumcision over the 13-year period from 1991 to 2005 were 40.8% for Medicaid clients versus 43.3% for the uninsured and 64.4% for insured newborns.⁵ The associations with insurance status were independent of race/ethnicity and socioeconomic status in this study.²⁴⁶

As noted, a recent cost-effectiveness analysis by the CDC concluded that newborn circumcision is a societal cost-saving HIV prevention intervention.⁶⁰ African-American and Hispanic males in the United States are disproportionately affected by HIV and other STIs, and thus would derive the greatest benefit from circumcision; the HIV prevention evidence for non-Hispanic white males was not as strong as for African-American and Hispanic males. However, the African-American and Hispanic populations are the most likely to have Medicaid coverage.²⁴⁷ In 2010, 50% of Hispanic children (up to age 18 years) and 54% of African-American children were covered by Medicaid, compared with 23% of white children.²⁴⁸ Thus, recent efforts by state Medicaid programs to curb payment for newborn male circumcision affect those populations that could benefit the most from the procedure.⁶⁰ The CDC authors recommended that: "Financial barriers that prevent parents from having the choice to circumcise their male newborns should be reduced or eliminated."

AREAS FOR FUTURE RESEARCH

In the course of its work, the Task Force identified important gaps in our knowledge of male circumcision and urges the research community to seriously consider these gaps as future research agendas are developed. Although it is clear that there is good evidence on the risks and benefits of male circumcision, it will be useful for this benefit to be more precisely defined in a US setting and to monitor

adverse events. Specifically, the Task Force recommends additional studies to better understand:

- The performance of elective male circumcisions in the United States, including those that are hospital-based and nonhospital-based, in infancy and subsequently in life.
- Parental decision-making to develop useful tools for communication between providers and parents on the issue of male circumcision.
- The impact of male circumcision on transmission of HIV and other STIs in the United States because key studies to date have been performed in African populations with HIV burdens that are epidemiologically different from HIV in the United States.
- The risk of acquisition of HIV and other STIs in 0- to 18-year-olds, to help inform the acceptance of the procedure during infancy versus deferring the decision to perform circumcision (and thus the procedure's benefits) until the child can provide his own assent/consent. Because newborn male circumcision is less expensive and more widely available, a delay often means that circumcision does not occur. It will be useful to more precisely define the prevention benefits conferred by male circumcision to inform parental decision-making and to evaluate cost-effectiveness and benefits of circumcision, especially in terms of numbers needed to treat to prevent specific outcomes.
- The population-based incidence of complications of newborn male circumcision (including stratifications according to timing of procedure, type of procedure, provider type, setting, and timing of complications [especially severe and non-acute complications]).
- The impact of the AAP Male Circumcision policy on newborn male

circumcision practices in the United States and elsewhere.

- The extent and level of training of the workforce to sustain the availability of safe circumcision practices for newborn males and their families.

CONCLUSIONS

This technical report provides recommendations regarding the practice of male circumcision, particularly in the newborn period. It emphasizes the primacy of parental decision-making and the imperative for those who perform male circumcisions to be adequately trained and use both effective sterile techniques and pain management. The report evaluated current evidence regarding the effect of male circumcision on the prevention of STIs (including HIV), UTIs, cancer, and other morbidities. Evidence about complications resulting from male circumcision and the use of analgesia and anesthesia were also discussed. The Task Force concluded that the health benefits of newborn male circumcision outweigh the risks and justify access to this procedure for families who choose it.

The Task Force also made the following recommendations:

- Evaluation of current evidence indicates that the health benefits of newborn male circumcision outweigh the risks, and the benefits of newborn male circumcision justify access to this procedure for those families who choose it.
- Parents are entitled to factually correct, nonbiased information about circumcision that should be provided before conception and early in pregnancy, when parents are most likely to be weighing the option of circumcision of a male child.
- Physicians counseling families about elective male circumcision should assist parents by explaining, in

a nonbiased manner, the potential benefits and risks, and by ensuring that they understand the elective nature of the procedure.

- Parents should weigh the health benefits and risks in light of their own religious, cultural, and personal preferences, as the medical benefits alone may not outweigh these other considerations for individual families.
- Parents of newborn boys should be instructed in the care of the penis at the time of discharge from the newborn hospital stay, whether the newborn is circumcised or not.
- Elective circumcision should be performed only if the infant's condition is stable and healthy.
- Trained and competent practitioners, by using sterile techniques and effective pain management, should perform male circumcision.
- Analgesia is safe and effective in reducing the procedural pain associated with newborn circumcision; thus, adequate analgesia should be provided whenever newborn circumcision is performed.
 - Nonpharmacologic techniques (such as positioning and sucrose pacifiers) alone are insufficient to prevent procedural and postprocedural pain and are not recommended as the sole method of analgesia. They should be used only as analgesic adjuncts to improve infant comfort during circumcision.
 - If used, topical creams may cause a higher incidence of skin irritation in low birth weight infants, compared with infants of normal weight, so penile nerve block techniques should be chosen for this group of newborns.
- Key professional organizations (AAP, AAFP, ACOG, the American Society of Anesthesiologists, the American

College of Nurse-Midwives, and other midlevel clinicians such as nurse practitioners) should work collaboratively to:

- Develop standards of trainee proficiency in performance of anesthetic and procedure techniques, including suturing;
 - Teach the procedure and analgesic techniques during postgraduate training programs;
 - Develop educational materials for clinicians to enhance practitioners' competency in discussing the benefits and risks of circumcision with parents;
 - Offer educational materials to assist parents of male infants with the care of both circumcised and uncircumcised penises.
- The preventive and public health benefits associated with newborn male circumcision warrant third-party reimbursement of the procedure.

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REFERENCES

- American Academy of Pediatrics. Circumcision Policy Statement. Task Force on Circumcision. *Pediatrics*. 1999;103(3):686–693. Reaffirmation published ~on 116(3): 796
- Centers for Disease Control and Prevention (CDC). Trends in in-hospital newborn male circumcision—United States, 1999–2010. *MMWR Morb Mortal Wkly Rep*. 2011;60(34):1167–1168
- Warner L, Cox S, Kuklina E, et al. Updated trends in the incidence of circumcision among male newborn delivery hospitalizations in the United States, 2000–2008. Paper presented at: National HIV Prevention Conference; August 26, 2011; Atlanta, GA
- Overview of the Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality; 2009. Available at: www.hcup-us.ahrq.gov/overview.jsp
- Nelson CP, Dunn R, Wan J, Wei JT. The increasing incidence of newborn circumcision: data from the nationwide inpatient sample. *J Urol*. 2005;173(3):978–981
- Xu F, Markowitz LE, Sternberg MR, Aral SO. Prevalence of circumcision and herpes simplex virus type 2 infection in men in the United States: the National Health and Nutrition Examination Survey (NHANES), 1999–2004. *Sex Transm Dis*. 2007;34(7):479–484
- Risser JM, Risser WL, Eissa MA, Cromwell PF, Barratt MS, Bortot A. Self-assessment of circumcision status by adolescents. *Am J Epidemiol*. 2004;159(11):1095–1097
- Diseker RA, III, Lin LS, Kamb ML, et al. Fleeting foreskins: the misclassification of male circumcision status. *Sex Transm Dis*. 2001;28(6):330–335
- American Academy of Pediatrics, Committee on Bioethics. Informed consent, parental permission, and assent in pediatric practice. *Pediatrics*. 1995;95(2):314–317
- Diekema DS. Parental refusals of medical treatment: the harm principle as threshold for state intervention. *Theor Med Bioeth*. 2004;25(4):243–264
- Fleischman AR, Nolan K, Dubler NN, et al. Caring for gravely ill children. *Pediatrics*. 1994;94(4 pt 1):433–439
- Benatar M, Benatar D. Between prophylaxis and child abuse: the ethics of neonatal male circumcision. *Am J Bioeth*. 2003;3(2):35–48
- Diekema DS. Boldt v. Boldt: a pediatric ethics perspective. *J Clin Ethics*. 2009;20(3):251–257
- British Medical Association. The law and ethics of male circumcision: guidance for doctors. *J Med Ethics*. 2004;30(3):259–263
- Cummins RO, Hazinski MF. The most important changes in the international ECC and CPR guidelines 2000 [editorial]. *Circulation*. 2000;102(suppl 8):I371–I376
- Tiemstra JD. Factors affecting the circumcision decision. *J Am Board Fam Pract*. 1999;12(1):16–20
- Walton RE, Ostbye T, Campbell MK. Neonatal male circumcision after delisting in Ontario. Survey of new parents. *Can Fam Physician*. 1997;43:1241–1247
- Ciesielski-Carlucci C, Milliken N, Cohen NH. Determinants of decision making for circumcision. *Camb Q Healthc Ethics*. 1996;5(2):228–236
- American Academy of Pediatrics. *Periodic Survey of Fellows: Counseling on Circumcision*. Elk Grove Village, IL: American Academy of Pediatrics; 2009
- Binner SL, Mastrobattista JM, Day MC, Swaim LS, Monga M. Effect of parental education on decision-making about neonatal circumcision. *South Med J*. 2002;95(4):457–461
- Adler R, Ottaway MS, Gould S. Circumcision: we have heard from the experts; now let's hear from the parents. *Pediatrics*. 2001;107(2). Available at: www.pediatrics.org/cgi/content/full/107/2/e20
- Turini GA, III, Reinert SE, McQuiston LD, Caldamone AA. Circumcision: a study of current parental decision-making. *Med Health R I*. 2006;89(11):365–367
- Leibowitz AA, Desmond K, Belin T. Determinants and policy implications of male circumcision in the US. *Am J Public Health*. 2009;99(1):138–145
- American Academy of Pediatrics. Caring for your son's penis. In: *Caring for Your Baby and Young Child: Birth to Age 5*. Elk Grove Village, IL: American Academy of Pediatrics; 2009
- Camille CJ, Kuo RL, Wiener JS. Caring for the uncircumcised penis: what parents (and you) need to know. *Contemp Pediatr*. 2002;19(11):61–73
- Günşar C, Kurutepe S, Alparslan O, et al. The effect of circumcision status on periurethral and glanular bacterial flora. *Urol Int*. 2004;72(3):212–215
- Aridoğan IA, Ilkit M, İzol V, Ates A, Demirhindi H. Glans penis and prepuce colonisation of yeast fungi in a paediatric population: pre- and postcircumcision results. *Mycoses*. 2009;52(1):49–52
- O'Farrell N, Morison L, Chung CK. Low prevalence of penile wetness among male sexually transmitted infection clinic attendees in London. *Sex Transm Dis*. 2007;34(6):408–409
- O'Farrell N, Morison L, Moodley P, et al. Association between HIV and subpreputial penile wetness in uncircumcised men in South Africa. *J Acquir Immune Defic Syndr*. 2006;43(1):69–77
- O'Farrell N, Quigley M, Fox P. Association between the intact foreskin and inferior standards of male genital hygiene behaviour: a cross-sectional study. *Int J STD AIDS*. 2005;16(8):556–559
- Sexually transmitted diseases (STDs): genital herpes. CDC fact sheet. Atlanta, GA: Centers for Disease Control and Prevention; January 31, 2012. Available at: www.cdc.gov/std/herpes/stdfact-herpes.htm
- Wawer MJ, Tobian AA, Kigozi G, et al. Effect of circumcision of HIV-negative men on transmission of human papillomavirus to HIV-negative women: a randomised trial in Rakai, Uganda. *Lancet*. 2011;377(9761):209–218
- Cherpes TL, Meyn LA, Krohn MA, Hillier SL. Risk factors for infection with herpes simplex virus type 2: role of smoking, douching, uncircumcised males, and vaginal flora. *Sex Transm Dis*. 2003;30(5):405–410
- Serour F, Samra Z, Kushel Z, Gorenstein A, Dan M. Comparative periurethral bacteriology of uncircumcised and circumcised males. *Genitourin Med*. 1997;73(4):288–290
- Sullivan PS, Kilmarx PH, Peterman TA, et al. Male circumcision for prevention of HIV transmission: what the new data mean for HIV prevention in the United States. *PLoS Med*. 2007;4(7):e223
- Warner L, Ghanem KG, Newman DR, Macaluso M, Sullivan PS, Erbedding EJ. Male circumcision and risk of HIV infection among heterosexual African American men attending Baltimore sexually transmitted disease clinics. *J Infect Dis*. 2009;199(1):59–65
- Telzak EE, Chiasson MA, Bevier PJ, Stoneburner RL, Castro KG, Jaffe HW. HIV-1 seroconversion in patients with and without genital ulcer disease. A prospective study. *Ann Intern Med*. 1993;119(12):1181–1186
- HIV in the United States: at a glance. Atlanta, GA: Centers for Disease Control and Prevention; March 14, 2012. Available

- at: www.cdc.gov/hiv/resources/factsheets/us.htm
39. UN Joint Programme on HIV/AIDS, Global Report: UNAIDS Report on the Global AIDS Epidemic: 2009, November 2009, ISBN 978 92 9173 832 8 Available at: www.unaids.org/en/KnowledgeCentre/HIVData/EpiUpdate/EpiUpdArchive/2009/default.asp. 2012. Accessed July 28, 2012
 40. Johnson K, Way A. Risk factors for HIV infection in a national adult population: evidence from the 2003 Kenya Demographic and Health Survey. *J Acquir Immune Defic Syndr*. 2006;42(5):627–636
 41. Jewkes R, Dunkle K, Nduna M, et al. Factors associated with HIV sero-positivity in young, rural South African men. *Int J Epidemiol*. 2006;35(6):1455–1460
 42. Meier AS, Bukusi EA, Cohen CR, Holmes KK. Independent association of hygiene, socioeconomic status, and circumcision with reduced risk of HIV infection among Kenyan men. *J Acquir Immune Defic Syndr*. 2006;43(1):117–118
 43. Shaffer DN, Bautista CT, Sateren WB, et al. The protective effect of circumcision on HIV incidence in rural low-risk men circumcised predominantly by traditional circumcisers in Kenya: two-year follow-up of the Kericho HIV Cohort Study. *J Acquir Immune Defic Syndr*. 2007;45(4):371–379
 44. Baeten JM, Richardson BA, Lavreys L, et al. Female-to-male infectivity of HIV-1 among circumcised and uncircumcised Kenyan men. *J Infect Dis*. 2005;191(4):546–553
 45. Agot KE, Ndinya-Achola JO, Kreiss JK, Weiss NS. Risk of HIV-1 in rural Kenya: a comparison of circumcised and uncircumcised men. *Epidemiology*. 2004;15(2):157–163
 46. Auvert B, Buvé A, Ferry B, et al; Study Group on the Heterogeneity of HIV Epidemics in African Cities. Ecological and individual level analysis of risk factors for HIV infection in four urban populations in sub-Saharan Africa with different levels of HIV infection. *AIDS*. 2001;15(suppl 4):S15–S30
 47. Gray RH, Kiwanuka N, Quinn TC, et al; Rakai Project Team. Male circumcision and HIV acquisition and transmission: cohort studies in Rakai, Uganda. *AIDS*. 2000;14(15):2371–2381
 48. Quinn TC, Wawer MJ, Sewankambo N, et al; Rakai Project Study Group. Viral load and heterosexual transmission of human immunodeficiency virus type 1. *N Engl J Med*. 2000;342(13):921–929
 49. Lavreys L, Rakwar JP, Thompson ML, et al. Effect of circumcision on incidence of human immunodeficiency virus type 1 and other sexually transmitted diseases: a prospective cohort study of trucking company employees in Kenya. *J Infect Dis*. 1999;180(2):330–336
 50. Kelly R, Kiwanuka N, Wawer MJ, et al. Age of male circumcision and risk of prevalent HIV infection in rural Uganda. *AIDS*. 1999;13(3):399–405
 51. Urassa M, Todd J, Boerma JT, Hayes R, Isingo R. Male circumcision and susceptibility to HIV infection among men in Tanzania. *AIDS*. 1997;11(3):73–80
 52. Mbugua GG, Muthami LN, Mutura CW, et al. Epidemiology of HIV infection among long distance truck drivers in Kenya. *East Afr Med J*. 1995;72(8):515–518
 53. Seed J, Allen S, Mertens T, et al. Male circumcision, sexually transmitted disease, and risk of HIV. *J Acquir Immune Defic Syndr Hum Retrovirol*. 1995;8(1):83–90
 54. Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, Puren A. Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial [published correction appears in *PLoS Med*. 2006;3(15):e298]. *PLoS Med*. 2005;2(11):e298
 55. Gray RH, Kigozi G, Serwadda D, et al. Male circumcision for HIV prevention in men in Rakai, Uganda: a randomised trial. *Lancet*. 2007;369(9562):657–666
 56. Bailey RC, Moses S, Parker CB, et al. Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial. *Lancet*. 2007;369(9562):643–656
 57. Connolly C, Simbayi LC, Shanmugam R, Nqeketo A. Male circumcision and its relationship to HIV infection in South Africa: results of a national survey in 2002. *S Afr Med J*. 2008;98(10):789–794
 58. Brewer DD, Potterat JJ, Roberts JM, Jr; Brody S. Male and female circumcision associated with prevalent HIV infection in virgins and adolescents in Kenya, Lesotho, and Tanzania. *Ann Epidemiol*. 2007;17(3):217–226
 59. Grosskurth H, Mosha F, Todd J, et al. A community trial of the impact of improved sexually transmitted disease treatment on the HIV epidemic in rural Tanzania: 2. Baseline survey results. *AIDS*. 1995;9(8):927–934
 60. Sansom SL, Prabhu VS, Hutchinson AB, et al. Cost-effectiveness of newborn circumcision in reducing lifetime HIV risk among U.S. males. *PLoS ONE*. 2010;5(1):e8723
 61. Millett GA, Flores SA, Marks G, Reed JB, Herbst JH. Circumcision status and risk of HIV and sexually transmitted infections among men who have sex with men: a meta-analysis. *JAMA*. 2008;300(14):1674–1684
 62. Buchbinder SP, Vittinghoff E, Heagerty PJ, et al. Sexual risk, nitrite inhalant use, and lack of circumcision associated with HIV seroconversion in men who have sex with men in the United States. *J Acquir Immune Defic Syndr*. 2005;39(1):82–89
 63. Kapiga SH, Lyamuya EF, Lwihula GK, Hunter DJ. The incidence of HIV infection among women using family planning methods in Dar es Salaam, Tanzania. *AIDS*. 1998;12(1):75–84
 64. Turner AN, Morrison CS, Padian NS, et al. Men's circumcision status and women's risk of HIV acquisition in Zimbabwe and Uganda. *AIDS*. 2007;21(13):1779–1789
 65. Weiss HA, Hankins CA, Dickson K. Male circumcision and risk of HIV infection in women: a systematic review and meta-analysis. *Lancet Infect Dis*. 2009;9(11):669–677
 66. Wawer MJ, Makumbi F, Kigozi G, et al. Circumcision in HIV-infected men and its effect on HIV transmission to female partners in Rakai, Uganda: a randomised controlled trial. *Lancet*. 2009;374(9685):229–237
 67. 2010 Sexually transmitted diseases surveillance: syphilis. Atlanta, GA: Centers for Disease Control and Prevention; February 16, 2012. Available at: www.cdc.gov/std/stats10/syphilis.htm
 68. Weiss HA, Thomas SL, Munabi SK, Hayes RJ. Male circumcision and risk of syphilis, chancroid, and genital herpes: a systematic review and meta-analysis. *Sex Transm Infect*. 2006;82(2):101–109, discussion 110
 69. Todd J, Munguti K, Grosskurth H, et al. Risk factors for active syphilis and TPHA seroconversion in a rural African population. *Sex Transm Infect*. 2001;77(1):37–45
 70. Mahiane SG, Legeai C, Taljaard D, et al. Transmission probabilities of HIV and herpes simplex virus type 2, effect of male circumcision and interaction: a longitudinal study in a township of South Africa. *AIDS*. 2009;23(3):377–383
 71. Tobian AA, Serwadda D, Quinn TC, et al. Male circumcision for the prevention of HSV-2 and HPV infections and syphilis. *N Engl J Med*. 2009;360(13):1298–1309
 72. 2010 Sexually transmitted diseases surveillance: other sexually transmitted disease—herpes simplex virus. Atlanta, GA: Centers for Disease Control and Prevention; November 17, 2011. Available at: www.cdc.gov/std/stats10/other.htm

73. Sobngwi-Tambekou J, Taljaard D, Nieuwoudt M, Lissouba P, Puren A, Auvert B. Male circumcision and *Neisseria gonorrhoeae*, *Chlamydia trachomatis* and *Trichomonas vaginalis*: observations after a randomised controlled trial for HIV prevention. *Sex Transm Infect.* 2009;85(2):116–120
74. Dickson N, van Roode T, Paul C. Herpes simplex virus type 2 status at age 26 is not related to early circumcision in a birth cohort. *Sex Transm Dis.* 2005;32(8):517–519
75. 2010 Sexually transmitted diseases surveillance: other sexually transmitted diseases—chancroid. Atlanta, GA: Centers for Disease Control and Prevention; November 17, 2011. Available at: www.cdc.gov/std/stats10/default.htm
76. Van Howe RS. Variability in penile appearance and penile findings: a prospective study. *Br J Urol.* 1997;80(5):776–782
77. Medline Plus Health Topics. Lymphogranuloma venereum. National Institutes of Health, National Library of Medicine, Rockville, MD: NLM. Available at: www.nlm.nih.gov/medlineplus/ency/article/000634.htm. Accessed August 24, 2011
78. Van Howe RS. Genital ulcerative disease and sexually transmitted urethritis and circumcision: a meta-analysis. *Int J STD AIDS.* 2007;18(12):799–809
79. Langeni T. Male circumcision and sexually transmitted infections in Botswana. *J Biosoc Sci.* 2005;37(1):75–88
80. Sexually transmitted diseases: bacterial vaginosis. CDC fact sheet. Atlanta, GA: Centers for Disease Control and Prevention; September 1, 2010. Available at: www.cdc.gov/std/bv/STDFact-Bacterial-Vaginosis.htm
81. Gray RH, Kigozi G, Serwadda D, et al. The effects of male circumcision on female partners' genital tract symptoms and vaginal infections in a randomized trial in Rakai, Uganda. *Am J Obstet Gynecol.* 2009;200(1):42.e1–e7
82. Cherpes TL, Hillier SL, Meyn LA, Busch JL, Krohn MA. A delicate balance: risk factors for acquisition of bacterial vaginosis include sexual activity, absence of hydrogen peroxide-producing lactobacilli, black race, and positive herpes simplex virus type 2 serology. *Sex Transm Dis.* 2008;35(1):78–83
83. Zenilman JM, Fresia A, Berger B, McCormack WM. Bacterial vaginosis is not associated with circumcision status of the current male partner. *Sex Transm Infect.* 1999;75(5):347–348
84. 2010 Sexually transmitted diseases surveillance: chlamydia. Atlanta, GA: Centers for Disease Control and Prevention; November 17, 2011. Available at: www.cdc.gov/std/stats10/default.htm
85. Dickson NP, van Roode T, Herbison P, Paul C. Circumcision and risk of sexually transmitted infections in a birth cohort. *J Pediatr.* 2008;152(3):383–387
86. Gray R, Azire J, Serwadda D, et al. Male circumcision and the risk of sexually transmitted infections and HIV in Rakai, Uganda. *AIDS.* 2004;18(18):2428–2430
87. Diseker RA, III, Peterman TA, Kamb ML, et al. Circumcision and STD in the United States: cross sectional and cohort analyses. *Sex Transm Infect.* 2000;76(6):474–479
88. Fergusson DM, Boden JM, Horwood LJ. Circumcision status and risk of sexually transmitted infection in young adult males: an analysis of a longitudinal birth cohort [published correction appears in *Pediatrics.* 2007;119(1):227]. *Pediatrics.* 2006;118(5):1971–1977
89. Turner AN, Morrison CS, Padian NS, et al. Male circumcision and women's risk of incident chlamydial, gonococcal, and trichomonal infections. *Sex Transm Dis.* 2008;35(7):689–695
90. Castellsagué X, Peeling RW, Franceschi S, et al; IARC Multicenter Cervical Cancer Study Group. Chlamydia trachomatis infection in female partners of circumcised and uncircumcised adult men. *Am J Epidemiol.* 2005;162(9):907–916
91. 2010 Sexually transmitted diseases surveillance: gonorrhoea. Atlanta, GA: Centers for Disease Control and Prevention; November 17, 2011. Available at: www.cdc.gov/std/stats10/gonorrhoea.htm
92. Mattson CL, Campbell RT, Bailey RC, Agot K, Ndinya-Achola JO, Moses S. Risk compensation is not associated with male circumcision in Kisumu, Kenya: a multi-faceted assessment of men enrolled in a randomized controlled trial. *PLoS ONE.* 2008;3(6):e2443
93. Talukdar A, Khandokar MR, Bandopadhyay SK, Detels R. Risk of HIV infection but not other sexually transmitted diseases is lower among homeless Muslim men in Kolkata. *AIDS.* 2007;21(16):2231–2235
94. Reynolds SJ, Shepherd ME, Risbud AR, et al. Male circumcision and risk of HIV-1 and other sexually transmitted infections in India. *Lancet.* 2004;363(9414):1039–1040
95. 2010 Sexually transmitted diseases surveillance: other sexually transmitted diseases—human papillomavirus. Atlanta, GA: Centers for Disease Control and Prevention; November 17, 2011. Available at: www.cdc.gov/std/stats10/other.htm
96. Giuliano AR, Lazcano E, Villa LL, et al. Circumcision and sexual behavior: factors independently associated with human papillomavirus detection among men in the HIM study. *Int J Cancer.* 2009;124(6):1251–1257
97. Nielson CM, Schiaffino MK, Dunne EF, Salemi JL, Giuliano AR. Associations between male anogenital human papillomavirus infection and circumcision by anatomic site sampled and lifetime number of female sex partners. *J Infect Dis.* 2009;199(1):7–13
98. Hernandez BY, Wilkens LR, Zhu X, et al. Circumcision and human papillomavirus infection in men: a site-specific comparison. *J Infect Dis.* 2008;197(6):787–794
99. Baldwin SB, Wallace DR, Papenfuss MR, Abrahamsen M, Vaught LC, Giuliano AR. Condom use and other factors affecting penile human papillomavirus detection in men attending a sexually transmitted disease clinic. *Sex Transm Dis.* 2004;31(10):601–607
100. Castellsagué X, Bosch FX, Muñoz N, et al; International Agency for Research on Cancer Multicenter Cervical Cancer Study Group. Male circumcision, penile human papillomavirus infection, and cervical cancer in female partners. *N Engl J Med.* 2002;346(15):1105–1112
101. Svare EI, Kjaer SK, Worm AM, Osterlind A, Meijer CJ, van den Brule AJ. Risk factors for genital HPV DNA in men resemble those found in women: a study of male attendees at a Danish STD clinic. *Sex Transm Infect.* 2002;78(3):215–218
102. Auvert B, Sobngwi-Tambekou J, Cutler E, et al. Effect of male circumcision on the prevalence of high-risk human papillomavirus in young men: results of a randomized controlled trial conducted in Orange Farm, South Africa. *J Infect Dis.* 2009;199(1):14–19
103. Tobian AA, Kong X, Wawer MJ, et al. Circumcision of HIV-infected men and transmission of human papillomavirus to female partners: analyses of data from a randomised trial in Rakai, Uganda. *Lancet Infect Dis.* 2011;11(8):604–612
104. Healthcare-associated infections: urinary tract infections (UTI). Atlanta, GA: Centers for Disease Control and Prevention; May 17, 2012. Available at: www.cdc.gov/HAI/ca_uti/uti.html
105. Shaikh N, Morone NE, Bost JE, Farrell MH. Prevalence of urinary tract infection in

- childhood: a meta-analysis. *Pediatr Infect Dis J*. 2008;27(4):302–308
106. Singh-Grewal D, Macdessi J, Craig J. Circumcision for the prevention of urinary tract infection in boys: a systematic review of randomised trials and observational studies. *Arch Dis Child*. 2005;90(8):853–858
 107. To T, Agha M, Dick PT, Feldman W. Cohort study on circumcision of newborn boys and subsequent risk of urinary-tract infection. *Lancet*. 1998;352(9143):1813–1816
 108. Zorc JJ, Levine DA, Platt SL, et al; Multi-center RSV-SBI Study Group of the Pediatric Emergency Medicine Collaborative Research Committee of the American Academy of Pediatrics. Clinical and demographic factors associated with urinary tract infection in young febrile infants. *Pediatrics*. 2005;116(3):644–648
 109. Newman TB, Bernzweig JA, Takayama JI, Finch SA, Wasserman RC, Pantell RH. Urine testing and urinary tract infections in febrile infants seen in office settings: the Pediatric Research in Office Settings' Febrile Infant Study. *Arch Pediatr Adolesc Med*. 2002;156(1):44–54
 110. Schoen EJ, Colby CJ, Ray GT. Newborn circumcision decreases incidence and costs of urinary tract infections during the first year of life. *Pediatrics*. 2000;105(4 pt 1):789–793
 111. Shaw KN, Gorelick M, McGowan KL, Yakscoe NM, Schwartz JS. Prevalence of urinary tract infection in febrile young children in the emergency department. *Pediatrics*. 1998;102(2). Available at: www.pediatrics.org/cgi/content/full/102/2/e16
 112. Craig JC, Knight JF, Sureshkumar P, Mantz E, Roy LP. Effect of circumcision on incidence of urinary tract infection in pre-school boys. *J Pediatr*. 1996;128(1):23–27
 113. Wijesinha SS, Atkins BL, Dudley NE, Tam PK. Does circumcision alter the periurethral bacterial flora? *Pediatr Surg Int*. 1998;13(2–3):146–148
 114. Wiswell TE, Hachey WE. Urinary tract infections and the uncircumcised state: an update. *Clin Pediatr (Phila)*. 1993;32(3):130–134
 115. Wiswell TE, Miller GM, Gelston HM, Jr; Jones SK, Clemmings AF. Effect of circumcision status on periurethral bacterial flora during the first year of life. *J Pediatr*. 1988;113(3):442–446
 116. Fussell EN, Kaack MB, Cherry R, Roberts JA. Adherence of bacteria to human foreskins. *J Urol*. 1988;140(5):997–1001
 117. Barnholtz-Sloan JS, Maldonado JL, Pow-sang J, Giuliano AR. Incidence trends in primary malignant penile cancer [published correction appears in *Urol Oncol*. 2008;26(1):112]. *Urol Oncol*. 2007;25(5):361–367
 118. Frisch M, Friis S, Kjaer SK, Melbye M. Falling incidence of penis cancer in an uncircumcised population (Denmark 1943-90). *BMJ*. 1995;311(7018):1471
 119. Daling JR, Madeleine MM, Johnson LG, et al. Penile cancer: importance of circumcision, human papillomavirus and smoking in situ and invasive disease. *Int J Cancer*. 2005;116(4):606–616
 120. Tsen HF, Morgenstern H, Mack T, Peters RK. Risk factors for penile cancer: results of a population-based case-control study in Los Angeles County (United States). *Cancer Causes Control*. 2001;12(3):267–277
 121. Christakis DA, Harvey E, Zerr DM, Feudtner C, Wright JA, Connell FA. A trade-off analysis of routine newborn circumcision. *Pediatrics*. 2000;105(1 pt 3):246–249
 122. Learman LA. Neonatal circumcision: a dispassionate analysis. *Clin Obstet Gynecol*. 1999;42(4):849–859
 123. Wiswell TE, Geschke DW. Risks from circumcision during the first month of life compared with those for uncircumcised boys. *Pediatrics*. 1989;83(6):1011–1015
 124. World Health Organization. *World Cancer Report*. Geneva, Switzerland: World Health Organization; 2003
 125. Fergusson DM, Lawton JM, Shannon FT. Neonatal circumcision and penile problems: an 8-year longitudinal study. *Pediatrics*. 1988;81(4):537–541
 126. Kigozi G, Watya S, Polis CB, et al. The effect of male circumcision on sexual satisfaction and function, results from a randomized trial of male circumcision for human immunodeficiency virus prevention, Rakai, Uganda. *BJU Int*. 2008;101(1):65–70
 127. Krieger JN, Mehta SD, Bailey RC, et al. Adult male circumcision: effects on sexual function and sexual satisfaction in Kisumu, Kenya. *J Sex Med*. 2008;5(11):2610–2622
 128. Bleustein CB, Fogarty JD, Eckholdt H, Arezzo JC, Melman A. Effect of circumcision on penile neurologic sensation. *Urology*. 2005;65(4):773–777
 129. Waldinger MD, Quinn P, Dilleen M, Mundayat R, Schweitzer DH, Boolell M. A multinational population survey of intravaginal ejaculation latency time. *J Sex Med*. 2005;2(4):492–497
 130. Senol MG, Sen B, Karademir K, Sen H, Saraçoğlu M. The effect of male circumcision on pudendal evoked potentials and sexual satisfaction. *Acta Neurol Belg*. 2008;108(3):90–93
 131. Senkul T, Işerl C, Şen B, Karademir K, Saraçoğlu F, Erden D. Circumcision in adults: effect on sexual function. *Urology*. 2004;63(1):155–158
 132. Sorrells ML, Snyder JL, Reiss MD, et al. Fine-touch pressure thresholds in the adult penis. *BJU Int*. 2007;99(4):864–869
 133. Kim D, Pang MG. The effect of male circumcision on sexuality. *BJU Int*. 2007;99(3):619–622
 134. Richters J, Smith AM, de Visser RO, Grulich AE, Rissel CE. Circumcision in Australia: prevalence and effects on sexual health. *Int J STD AIDS*. 2006;17(8):547–554
 135. Laumann EO, Masi CM, Zuckerman EW. Circumcision in the United States. Prevalence, prophylactic effects, and sexual practice. *JAMA*. 1997;277(13):1052–1057
 136. Payne K, Thaler L, Kukkonen T, Carrier S, Binik Y. Sensation and sexual arousal in circumcised and uncircumcised men. *J Sex Med*. 2007;4(3):667–674
 137. Prevention and management of pain and stress in the neonate. American Academy of Pediatrics. Committee on Fetus and Newborn. Committee on Drugs. Section on Anesthesiology. Section on Surgery. Canadian Paediatric Society. Fetus and Newborn Committee. *Pediatrics*. 2000;105(2):454–461
 138. American Academy of Pediatrics, Committee on Fetus and Newborn and Section on Surgery; Canadian Paediatric Society and Fetus and Newborn Committee. Prevention and management of pain in the neonate: an update [published correction appears in *Pediatrics*. 2007;119(2):425]. *Pediatrics*. 2006;118(5):2231–2241
 139. Taddio A, Ohlsson K, Ohlsson A. Lidocaine-prilocaine cream for analgesia during circumcision in newborn boys. *Cochrane Database Syst Rev*. 1999;(2):CD000496
 140. Woodman PJ. Topical lidocaine-prilocaine versus lidocaine for neonatal circumcision: a randomized controlled trial. *Obstet Gynecol*. 1999;93(5 pt 1):775–779
 141. Kass FC, Holman JR. Oral glucose solution for analgesia in infant circumcision. *J Fam Pract*. 2001;50(9):785–788
 142. Butler-O'Hara M, LeMoine C, Guillet R. Analgesia for neonatal circumcision: a randomized controlled trial of EMLA cream versus dorsal penile nerve block. *Pediatrics*. 1998;101(4). Available at: www.pediatrics.org/cgi/content/full/101/4/e5
 143. Kurtis PS, DeSilva HN, Bernstein BA, Malakh L, Schechter NL. A comparison of the Mogen and Gomco clamps in combination with dorsal penile nerve block in minimizing the pain of neonatal circumcision. *Pediatrics*. 1999;103(2). Available at: www.pediatrics.org/cgi/content/full/103/2/e23

144. Brady-Fryer B, Wiebe N, Lander JA. Pain relief for neonatal circumcision. *Cochrane Database Syst Rev*. 2004;(4):CD004217
145. Taddio A, Katz J, Ilersich AL, Koren G. Effect of neonatal circumcision on pain response during subsequent routine vaccination. *Lancet*. 1997;349(9052):599–603
146. Stang JH, Snellman LW, Condon LM, et al. Beyond dorsal penile nerve block: a more humane circumcision. *Pediatrics*. 1997;100(2). Available at: www.pediatrics.org/cgi/content/full/100/2/e3
147. Blass EM, Hoffmeyer LB. Sucrose as an analgesic for newborn infants. *Pediatrics*. 1991;87(2):215–218
148. Mohan CG, Risucci DA, Casimir M, Gulrajani-LaCorte M. Comparison of analgesics in ameliorating the pain of circumcision. *J Perinatol*. 1998;18(1):13–19
149. Herschel M, Khoshnood B, Ellman C, Maydew N, Mittendorf R. Neonatal circumcision. Randomized trial of a sucrose pacifier for pain control. *Arch Pediatr Adolesc Med*. 1998;152(3):279–284
150. Taddio A, Stevens B, Craig K, et al. Efficacy and safety of lidocaine-prilocaine cream for pain during circumcision. *N Engl J Med*. 1997;336(17):1197–1201
151. Benini F, Johnston CC, Faucher D, Aranda JV. Topical anesthesia during circumcision in newborn infants. *JAMA*. 1993;270(7):850–853
152. Lander J, Brady-Fryer B, Metcalfe JB, Nazarali S, Muttitt S. Comparison of ring block, dorsal penile nerve block, and topical anesthesia for neonatal circumcision: a randomized controlled trial. *JAMA*. 1997;278(24):2157–2162
153. Lehr VT, Cepeda E, Frattarelli DA, Thomas R, LaMothe J, Aranda JV. Lidocaine 4% cream compared with lidocaine 2.5% and prilocaine 2.5% or dorsal penile block for circumcision. *Am J Perinatol*. 2005;22(5):231–237
154. Holliday MA, Pinckert TL, Kiernan SC, Kunos I, Angelus P, Keszler M. Dorsal penile nerve block vs topical placebo for circumcision in low-birth-weight neonates. *Arch Pediatr Adolesc Med*. 1999;153(5):476–480
155. Lehr VT, Taddio A. Topical anesthesia in neonates: clinical practices and practical considerations. *Semin Perinatol*. 2007;31(5):323–329
156. Nioloux C, Floch-Tudal C, Jaby-Sergent MP, Lejeune C. Local anesthesia with Emla cream and risk of methemoglobinemia in a premature infant [in French]. *Arch Pediatr*. 1995;2(3):291–292
157. Couper RTL. Methaemoglobinaemia secondary to topical lignocaine/prilocaine in a circumcised neonate. *J Paediatr Child Health*. 2000;36:406–407
158. Kumar AR, Dunn N, Nauqi M. Methaemoglobinaemia associated with a prilocaine-lidocaine cream. *Clin Pediatr*. 1997;36:239–240
159. Maxwell LG, Yaster M, Wetzel RC, Niebyl JR. Penile nerve block for newborn circumcision. *Obstet Gynecol*. 1987;70(3 pt 1):415–419
160. Taddio A. Pain management for neonatal circumcision. *Paediatr Drugs*. 2001;3(2):101–111
161. Howard CR, Howard FM, Fortune K, et al. A randomized, controlled trial of a eutectic mixture of local anesthetic cream (lidocaine and prilocaine) versus penile nerve block for pain relief during circumcision. *Am J Obstet Gynecol*. 1999;181(6):1506–1511
162. Lehr VT, Zeskind PS, Ofenstein JP, Cepeda E, Warriar I, Aranda JV. Neonatal facial coding system scores and spectral characteristics of infant crying during newborn circumcision. *Clin J Pain*. 2007;23(5):417–424
163. Snellman LW, Stang HJ. Prospective evaluation of complications of dorsal penile nerve block for neonatal circumcision. *Pediatrics*. 1995;95(5):705–708
164. Hardwick-Smith S, Mastrobattista JM, Wallace PA, Ritchey ML. Ring block for neonatal circumcision. *Obstet Gynecol*. 1998;91(6):930–934
165. Kakavouli A, Li G, Carson MP, et al. Intraoperative reported adverse events in children. *Paediatr Anaesth*. 2009;19(8):732–739
166. Hackel A, Badqwell JM, Binding RR, et al. Guidelines for the pediatric perioperative anesthesia environment. American Academy of Pediatrics. Section on Anesthesiology. *Pediatrics*. 1999;103(2):512–515
167. Gauntlett I. A comparison between local anaesthetic dorsal nerve block and caudal bupivacaine with ketamine for paediatric circumcision. *Paediatr Anaesth*. 2003;13(1):38–42
168. Irwin MG, Cheng W. Comparison of subcutaneous ring block of the penis with caudal epidural block for post-circumcision analgesia in children. *Anaesth Intensive Care*. 1996;24(3):365–367
169. Weksler N, Atias I, Klein M, Rosenztsveig V, Ovadia L, Gurman GM. Is penile block better than caudal epidural block for postcircumcision analgesia? *J Anesth*. 2005;19(1):36–39
170. Sharpe P, Klein JR, Thompson JP, et al. Analgesia for circumcision in a paediatric population: comparison of caudal bupivacaine alone with bupivacaine plus two doses of clonidine. *Paediatr Anaesth*. 2001;11(6):695–700
171. Shrestha BR, Bista B. Tramadol along with local anaesthetics in the penile block for the children undergoing circumcision. *Kathmandu Univ Med J (KUMJ)*. 2005;3(1):26–29
172. Naja ZA, Ziade FM, Al-Tannir MA, Abi Mansour RM, El-Rajab MA. Addition of clonidine and fentanyl: comparison between three different regional anesthetic techniques in circumcision. *Paediatr Anaesth*. 2005;15(11):964–970
173. McGowan PR, May H, Molnar Z, Cunliffe M. A comparison of three methods of analgesia in children having day case circumcision. *Paediatr Anaesth*. 1998;8(5):403–407
174. Serour F, Cohen A, Mandelberg A, Mori J, Ezra S. Dorsal penile nerve block in children undergoing circumcision in a day-care surgery. *Can J Anaesth*. 1996;43(9):954–958
175. Serour F, Reuben S, Ezra S. Circumcision in children with penile block alone. *J Urol*. 1995;153(2):474–476
176. Soh CR, Ng SB, Lim SL. Dorsal penile nerve block. *Paediatr Anaesth*. 2003;13(4):329–333
177. Serour F, Mandelberg A, Zabeeda D, Mori J, Ezra S. Efficacy of EMLA cream prior to dorsal penile nerve block for circumcision in children. *Acta Anaesthesiol Scand*. 1998;42(2):260–263
178. Holder KJ, Peutrell JM, Weir PM. Regional anaesthesia for circumcision. Subcutaneous ring block of the penis and subpubic penile block compared. *Eur J Anaesthesiol*. 1997;14(5):495–498
179. Sandeman DJ, Reiner D, Dille AV, Bennett MH, Kelly KJ. A retrospective audit of three different regional anaesthetic techniques for circumcision in children. *Anaesth Intensive Care*. 2010;38(3):519–524
180. Faraoni D, Gilbeau A, Lingier P, Barvais L, Engelman E, Hennart D. Does ultrasound guidance improve the efficacy of dorsal penile nerve block in children? *Paediatr Anaesth*. 2010;20(10):931–936
181. American Academy of Pediatrics Committee on Fetus and Newborn. Controversies concerning vitamin K and the newborn. *Pediatrics*. 2003;112(1 pt 1):191–192
182. A joint Position paper of the Paediatrics & Child Health Division of The Royal Australasian College of Physicians and The Australian Society of Otolaryngology, Head and Neck Surgery, 2008 Sydney
183. Ben Chaim J, Livne PM, Binyamini J, Hardak B, Ben-Meir D, Mor Y. Complications of circumcision in Israel: a one year

- multicenter survey. *Isr Med Assoc J*. 2005; 7(6):368–370
184. O'Brien TR, Calle EE, Poole WK. Incidence of neonatal circumcision in Atlanta, 1985–1986. *South Med J*. 1995;88(4):411–415
 185. Amir M, Raja MH, Niaz WA. Neonatal circumcision with Gomco clamp—a hospital-based retrospective study of 1000 cases. *J Pak Med Assoc*. 2000;50(7):224–227
 186. Okeke LI, Asinobi AA, Ikuerowo OS. Epidemiology of complications of male circumcision in Ibadan, Nigeria. *BMC Urol*. 2006;6:21
 187. Mayer E, Caruso DJ, Ankem M, Fisher MC, Cummings KB, Barone JG. Anatomic variants associated with newborn circumcision complications. *Can J Urol*. 2003;10(5):2013–2016
 188. Ponsky LE, Ross JH, Knipper N, Kay R. Penile adhesions after neonatal circumcision. *J Urol*. 2000;164(2):495–496
 189. El Bcheraoui C, Greenspan J, Kretsinger K, Chen R. Rates of selected neonatal male circumcision-associated severe adverse events in the United States, 2007–2009 (CDC). Proceedings, XVIII International AIDS Conference (AIDS 2010), August 5, 2010; Vienna, Austria
 190. Fraser ID, Tjoe J. Circumcision using bipolar diathermy scissors: a simple, safe and acceptable new technique. *Ann R Coll Surg Engl*. 2000;82(3):190–191
 191. Peters KM, Kass EJ. Electrosurgery for routine pediatric penile procedures. *J Urol*. 1997;157(4):1453–1455
 192. Wiswell TE, Tencer HL, Welch CA, Chamberlain JL. Circumcision in children beyond the neonatal period. *Pediatrics*. 1993;92(6):791–793
 193. Cheng W, Saing H. A prospective randomized study of wound approximation with tissue glue in circumcision in children. *J Paediatr Child Health*. 1997;33(6):515–516
 194. Schmitz RF, Schulpen TW, Redjopawiro MS, Liem MS, Madern GC, Van Der Werken C. Religious circumcision under local anesthesia with a new disposable clamp. *BJU Int*. 2001;88(6):581–585
 195. Cathcart P, Nuttall M, van der Meulen J, Emberton M, Kenny SE. Trends in paediatric circumcision and its complications in England between 1997 and 2003. *Br J Surg*. 2006;93(7):885–890
 196. Ozdemir E. Significantly increased complication risks with mass circumcisions. *Br J Urol*. 1997;80(1):136–139
 197. Yegane RA, Kheirollahi AR, Salehi NA, Bashashati M, Khoshdel JA, Ahmadi M. Late complications of circumcision in Iran. *Pediatr Surg Int*. 2006;22(5):442–445
 198. Ahmed A, Mbibi NH, Dawam D, Kalayi GD. Complications of traditional male circumcision. *Ann Trop Paediatr*. 1999;19(1):113–117
 199. Amukele SA, Lee GW, Stock JA, Hanna MK. 20-Year experience with iatrogenic penile injury. *J Urol*. 2003;170(4 pt 2):1691–1694
 200. Amputations with use of adult-size scissors-type circumcision clamps on infants. *Health Devices*. 1995;24(7):286–287
 201. Strimling BS. Partial amputation of glans penis during Moggen clamp circumcision. *Pediatrics*. 1996;97(6 pt 1):906–907
 202. Patel HI, Moriarty KP, Brisson PA, Feins NR. Genitourinary injuries in the newborn. *J Pediatr Surg*. 2001;36(1):235–239
 203. Ameh E, Sabo S, Muhammad I. Amputation of the penis during traditional circumcision. *Trop Doc*. 1997;27(2):117
 204. Neulander E, Walfisch S, Kaneti J. Amputation of distal penile glans during neonatal ritual circumcision—a rare complication. *Br J Urol*. 1996;77(6):924–925
 205. Hanukoglu A, Danielli L, Katzir Z, Gorenstein A, Fried D. Serious complications of routine ritual circumcision in a neonate: hydro-ureteronephrosis, amputation of glans penis, and hyponatraemia. *Eur J Pediatr*. 1995;154(4):314–315
 206. Erk Y, Kocabalkan O. A case report of penis reconstruction for partial penis necrosis following circumcision. *Turk J Pediatr*. 1995;37(1):79–82
 207. Gesundheit B, Grisaru-Soen G, Greenberg D, et al. Neonatal genital herpes simplex virus type 1 infection after Jewish ritual circumcision: modern medicine and religious tradition. *Pediatrics*. 2004;114(2). Available at: www.pediatrics.org/cgi/content/full/114/2/e259
 208. Rubin LG, Lanzkowsky P. Cutaneous neonatal herpes simplex infection associated with ritual circumcision. *Pediatr Infect Dis J*. 2000;19(3):266–268
 209. Centers for Disease Control and Prevention (CDC). Neonatal herpes simplex virus infection following Jewish ritual circumcisions that included direct orogenital suction—New York City, 2000–2011. *MMWR Morb Mortal Wkly Rep*. 2012;61:405–409
 210. Nguyen DM, Bancroft E, Mascola L, Guevara R, Yasuda L. Risk factors for neonatal methicillin-resistant *Staphylococcus aureus* infection in a well-infant nursery. *Infect Control Hosp Epidemiol*. 2007;28(4):406–411
 211. Yazici M, Etensel B, Gürsoy H. A very late onset urethral fistula coexisting with skin bridge after neonatal circumcision: a case report. *J Pediatr Surg*. 2003;38(4):642–645
 212. Tzeng YS, Tang SH, Meng E, Lin TF, Sun GH. Ischemic glans penis after circumcision. *Asian J Androl*. 2004;6(2):161–163
 213. Mogotlane SM, Ntlangulela JT, Ogunbanjo BG. Mortality and morbidity among traditionally circumcised Xhosa boys in the Eastern Cape Province, South Africa. *Curationis*. 2004;27(2):57–62
 214. Bailey RC, Egesah O, Rosenberg S. Male circumcision for HIV prevention: a prospective study of complications in clinical and traditional settings in Bungoma, Kenya. *Bull World Health Organ*. 2008;86(9):669–677
 215. Atikeler MK, Geçit I, Yüzgeç V, Yalçın O. Complications of circumcision performed within and outside the hospital. *Int Urol Nephrol*. 2005;37(1):97–99
 216. Wikipedia. Gomco clamp. Available at: http://en.wikipedia.org/wiki/Gomco_clamp#cite_note-8
 217. Blalock HJ, Vemulakonda V, Ritchey ML, Ribbeck M. Outpatient management of phimosis following newborn circumcision. *J Urol*. 2003;169(6):2332–2334
 218. Manji KP. Circumcision of the young infant in a developing country using the Plastibell. *Ann Trop Paediatr*. 2000;20(2):101–104
 219. Mihssin N, Moorthy K, Houghton PW. Retention of urine: an unusual complication of the Plastibell device. *BJU Int*. 1999;84(6):745
 220. Bliss DP, Jr; Healey PJ, Waldhausen JH. Necrotizing fasciitis after Plastibell circumcision. *J Pediatr*. 1997;131(3):459–462
 221. Palit V, Menebhi DK, Taylor I, Young M, Elmasry Y, Shah T. A unique service in UK delivering Plastibell circumcision: review of 9-year results. *Pediatr Surg Int*. 2007;23(1):45–48
 222. Duncan ND, Dundas SE, Brown B, Pinnock-Ramsaran C, Badal G. Newborn circumcision using the Plastibell device: an audit of practice. *West Indian Med J*. 2004;53(1):23–26
 223. Lazarus J, Alexander A, Rode H. Circumcision complications associated with the Plastibell device. *S Afr Med J*. 2007;97(3):192–193
 224. Beniamin F, Castagnetti M, Rigamonti W. Surgical management of penile amputation in children. *J Pediatr Surg*. 2008;43:1939–1943
 225. de Lagausie P, Jehanno P. Six years follow-up of a penis replantation in a child. *J Pediatr Surg*. 2008;43:E11–E12
 226. Perovic SV, Djinovic RP, Bumbasirevic MZ, Santucci RA, Djordjevic ML, Kourbatov D. Severe penile injuries: a problem of severity and reconstruction. *BJU Int*. 2009;104:676–687

227. Shaeer O. Restoration of the penis following amputation at circumcision: Shaeer's A-Y plasty. *J Sex Med.* 2008;5:1013–1021
228. Binous MY, Haddad B, Fekih W, Boudokhane M, Hellali K, Fodha M. [Amputation of a penile glans distal third and successful reattachment]. *Tunis Med.* 2008;86:608–609
229. Machmouchi M, Alkhotani A. Is neonatal circumcision judicious? *Eur J Pediatr Surg.* 2007;17(4):266–269
230. Wiswell TE, Smith FR, Bass JW. Decreased incidence of urinary tract infections in circumcised male infants. *Pediatrics.* 1985;75(5):901–903
231. Wiswell TE, Roscelli JD. Corroborative evidence for the decreased incidence of urinary tract infections in circumcised male infants. *Pediatrics.* 1986;78(1):96–99
232. Wiswell TE. The prepuce, urinary tract infections, and the consequences. *Pediatrics.* 2000;105:860–862
233. Lerman SE, Liao JC. Neonatal circumcision. *Pediatr Clin North Am.* 2001;48(6):1539–1557
234. Schoen EJ, Colby CJ, To TT. Cost analysis of neonatal circumcision in a large health maintenance organization. *J Urol.* 2006;175(3 pt 1):1111–1115
235. Vergidis PI, Falagas ME, Hamer DH. Meta-analytical studies on the epidemiology, prevention, and treatment of human immunodeficiency virus infection. *Infect Dis Clin North Am.* 2009;23(2):295–308
236. Waldeck SE. Social norm theory and male circumcision: why parents circumcise. *Am J Bioeth.* 2003;3(2):56–57
237. Soper RJ, Brooks G, Fletcher K, Sampson M. A training model for circumcision of the newborn. *Clin Pediatr (Phila).* 2001;40(7):409–412
238. Yawman D, Howard CR, Auinger P, Garfunkel LC, Allan M, Weitzman M. Pain relief for neonatal circumcision: a follow-up of residency training practices. *Ambul Pediatr.* 2006;6(4):210–214
239. Stang HJ, Snellman LW. Circumcision practice patterns in the United States. *Pediatrics.* 1998;101(6). Available at: www.pediatrics.org/cgi/content/full/101/6/e5
240. Howard CR, Howard FM, Garfunkel LC, de Blieck EA, Weitzman M. Neonatal circumcision and pain relief: current training practices. *Pediatrics.* 1998;101(3 pt 1):423–428
241. Brisson PA, Patel HI, Feins NR. Revision of circumcision in children: report of 56 cases. *J Pediatr Surg.* 2002;37(9):1343–1346
242. Chandran L, Latorre P. Neonatal circumcisions performed by pediatric residents: implementation of a training program. *Ambul Pediatr.* 2002;2(6):470–474
243. Brill JR, Wallace B. Neonatal circumcision model and competency evaluation for family medicine residents. *Fam Med.* 2007;39(4):241–243
244. Al-Ghazo MA, Banihani KE. Circumcision revision in male children. *Int Braz J Urol.* 2006;32(4):454–458
245. Clark SJ, Kilmarx PH, Kretsinger K. Coverage of newborn and adult male circumcision varies among public and private US payers despite health benefits. *Health Aff (Millwood).* 2011;30(12):2355–2361
246. Warner L, Cox S, Kuklina E, et al. Updated trends in the incidence of circumcision among male newborn delivery hospitalizations in the United States, 2000–2008. National HIV Prevention Conference; August 26, 2010; Atlanta, GA
247. Thomas M, James C. *Race, Ethnicity & Health Care Issue Brief: The Role of Health Coverage for Communities of Color.* Menlo Park, CA: The Henry J. Kaiser Family Foundation; 2009
248. SHADAC, State Health Access Data Assistance Center. American Community Survey (ACS). SHADAC data center, 2010. Available at: <http://www.shadac.org/datacenter>. Accessed May 4, 2012