PHYSICAL ACTIVITY RECOMMENDATIONS: WHERE DO WE GO FROM HERE?

The article by Strong et al[1] in this issue of *The Journal of Pediatrics* presents recommendations for the amount of physical activity in youth necessary to improve health and behavioral outcomes. The recommendations were the product of a critical and extensive review of more than 300 articles conducted by an independent expert committee composed of both clinical and public health experts and funded by the Division of Nutrition and Physical Activity at the Centers for Disease Control and Prevention. The references alone provide a valuable resource. The committee's recommendations agree with those of the Dietary Guidelines for Americans that school-age children participate daily in 60 minutes or more of moderate to vigorous physical activity.[2] Because the expert committee included representatives of many groups with expertise or investment in physical activity, the likelihood that these recommendations will be widely accepted and disseminated is increased.

Although the intent of the review was to develop physical activity recommendations for youth, the gaps in knowledge identified by the review provide the basis for research for years to come. It seems likely that the type and dose of physical activity necessary to prevent an adverse health outcome will depend on the adverse health outcome in question. For example, the amount of physical activity necessary to prevent or reduce cardiovascular disease risk factors may differ from the amount necessary to prevent obesity. Weight-bearing activities are more likely than swimming to prevent osteoporosis of the lower extremities or spine. Examination of the impact of physical activity on outcomes such as musculoskeletal or cardiovascular health in representative populations would augment the data derived from intervention studies. The role of physical activity in the origin and course of obesity provides a particularly rich area for investigation. For example, no studies have yet prospectively defined the amount of physical activity necessary to prevent excessive weight gain in children or adolescents. Although a recent Institute of Medicine report suggested that 60 minutes of moderate physical activity was necessary to prevent weight gain in adults,[3] these findings were based on the amount of physical activity necessary to move a sedentary individual to a level of moderate physical activity. However, the energy spent on activity by obese and nonobese adolescents is comparable,[4] and studies of youth have failed to find that reduced energy expenditure at baseline predicted increased gains in fatness.[5-7] Among youth,[8] as among adults,[9] increased physical activity appears to have a limited effect on weight loss. The dose of physical activity necessary to maintain weight after weight loss in children and adolescents has not been studied. Among adults, physical activity reduces or improves obesity-related comorbidities such as hypertension, dyslipidemia, and glucose intolerance.[10] As the review points out, physical activity appears to have the same beneficial effects in children. Although physical activity could therefore be expected to reduce obesity-associated comorbidities without an effect on weight, this issue has not been carefully examined.

One of the most important challenges is how to achieve these recommendations. The first step is for medical and public health practitioners to recognize the importance of physical activity. Successful implementation of the recommendations will require the efforts of both groups. Effective counseling by clinicians will likely depend on their ability to help patients and their families learn how to solve the problems that limit opportunities for children to be physically active.[11,12] Complementary strategies in schools and communities will also be required. Individual behavior change will be less likely if children live in environments that are unsafe or lack playgrounds or other recreational facilities. The Guide for Community Preventive Services, an evidence-based review of community interventions, recommends a variety of strategies to increase physical activity, such as physical education, community-wide campaigns, and access to and promotion of recreational facilities.[13] One of the most important barriers to increased physical activity of youth is the recent reduction in physical education programs in schools. This trend might well be reversed if studies demonstrate that physical activity improves classroom behavior and performance. The importance of access to recreational facilities suggests that providing resource lists for local facilities that offer opportunities for physical activity may be an important adjunct to counseling to increase physical activity. The committee that produced these recommendations has made a major contribution to the field of physical activity in youth. In doing so, they have reminded us how much more there remains to do.

See related article, p 732.

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STATISTICAL PROCESS CONTROL AND CALCINEURIN INHIBITOR MANAGEMENT

One wonders whether the article in this issue of *The Journal* by Bucuvalas et al[1] is a sneak preview of a wave of change that is about to transform medicine. In approaching the problem of better managing critical immunosuppressive drugs in children after liver transplantation, they have applied the principles of statistical process control with some success. This approach, now common in industry, was developed by Walter Shewart to control quality at Bell Laboratories in the 1920s. Our need to have outcomes drive change in medicine is extremely relevant to this approach. As of yet, our understanding of how to apply this powerful tool to improving medical care is rudimentary.

Transplantation of the liver in children has become an everyday event. More than 500 transplantations occur annually, and the success rates are excellent. However, the average recipient is 5 years old and faces a life of immunosuppressive medication. The calcineurin inhibitors, which form the foundation for successful transplantation, are toxic to the kidney. However, without these medicines, rejection of the transplanted organ leads to graft failure and patient death. Keeping medication in a narrow therapeutic range is not easy under ideal circumstances, and the circumstances are hardly ideal. Challenges include inadequate information regarding pharmacokinetics in children, absence of a simple reliable marker of drug exposure, frequent failures in medicine adherence, and the myriad of drug protocols and combinations currently in use.

Bucuvalas et al[1] have made a very important step forward in how to manage these important medications. Their work differs from prior efforts to improve our use of these drugs. In the past, exquisite management of the individual and their problems has been the most important characteristic of success in solid organ transplantation. The Cincinnati Liver Transplant Group has taken on the management of a critical drug in an entire class of patients, and it may have profound implications.

The background for this effort is worth retelling. While attending a conference on changing medical management using the principles of statistical process control, the authors realized that there could be an immediate application to their work in liver transplantation, particularly the management of calcineurin inhibitor level variability. They used the principles of statistical process control to design a change cycle that would lead to an increased proportion of calcineurin inhibitor drug levels within the target range. Testing their process on a small group of patients, they were able to prove the validity of their concept and then expand the process to the large group of patients whom they monitor. At the onset of this change cycle, only 50% of patients were within the target range. Currently, 85% are in the target

See related article, p 744.

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