Graduated Licensing and Beyond

Allan F. Williams, PhD, Daniel R. Mayhew, MA

Abstract: Although graduated driver licensing has successfully reduced the young driver problem in Canada and the U.S., this is still a major problem and more needs to be done. This article discusses what new measures are needed to further reduce the problem. To make graduated licensing work better, laws need strengthening; compliance needs to be enhanced through evidence-based programs involving parents, police, and adolescents; and consideration needs to be given to strengthening testing requirements. A major challenge is to integrate driver education with graduated licensing, and suggestions for doing so are provided here. There are many opportunities for building on the initial gains derived from present-day graduated systems. Taking advantage of these opportunities is likely to result in substantial crash reductions.
(Am J Prev Med 2008;35(3S):S324–S333)

Introduction

Injuries associated with motor vehicle crashes of young beginning drivers have long been a major health problem in Canada and the U.S., but only in the past decade has this problem received adequate recognition and response.

In prior decades, licenses were easy to get at an early age, aggravating the problem. Most countries license at age 17 or 18. An analysis of licensing laws in the U.S. prior to 1996 indicated that most states allowed licensure at age 16; the minimum age for regular licensure was 15 in five states and 14 in one.[1]

Only New Jersey withheld licensure until age 17. Just 30 states required learner permits to be obtained. Of those, only 11 had mandatory minimum permit-holding periods, ranging from 14 to 90 days. In most states, written and driving tests were easy, particularly in comparison with testing requirements in many European countries. A few states had established nighttime driving restrictions, some originating in the 1960s. However, in most states, full driving privileges were bestowed upon initial licensure. In Canada, the situation was similar historically to that in the U.S., with no province having a nighttime driving restriction and with relatively easy road tests to gain full, unrestricted driving privileges.

Prior to the graduated licensing era, the young driver problem in Canada and the U.S. was addressed primarily through driver education and training and through penalty-based systems, typically referred to as provisional or probationary programs. Young drivers could be subject to penalties (generally fines or license suspension) for fewer violations than would be the case for adults. These probationary systems were intended to identify problem drivers early and to remediate them quickly. Evaluations found the systems to have very modest positive effects on crashes.[2] Even though driver education was a popular approach to deal with the problem of young drivers in both Canada and the U.S., evaluations of such programs have consistently indicated that they do not produce drivers less likely to be in crashes than drivers without formal training. Thus, the prevailing ways in which the problem was dealt with in the 1960s, 1970s, and 1980s were inadequate.

In addition, the young driver problem was often thought of as an alcohol problem. Given that in the U.S. and Canada in the early 1980s more than half of the fatally injured drivers aged <21 had blood alcohol concentrations of 0.08% or greater, there was some truth to this belief. However, during these times, analyses lumped young drivers together as those aged 16–19 years, aged 16–20 years, or even aged 16–24 years.[3] This lumping masked the fact that those aged 16–17 years—the group most affected by licensing policies—are substantially different from older adolescents. For this age group, the underlying driving problem results primarily from the combination of youthful age and inexperience. Although alcohol was still a risk factor for all adolescent drivers, the youngest ones were the least likely to drive after drinking.[4]

Graduated licensing was discussed in the early 1970s,[5,6] and in that same decade the National Highway Traffic Safety Administration developed a model law and offered states financial incentives to adopt it.[7] However, only two states, California and Maryland, introduced some elements of graduated licensing. Even though these programs were evaluated and found to have modest safety effects, graduated licensing was not

From private consultancy (Williams), Bethesda, Maryland; and the Traffic Injury Research Foundation (Mayhew), Ottawa, Canada

Address correspondence and reprint requests to: Daniel R. Mayhew, MA, Traffic Injury Research Foundation, 171 Nepean Street, Suite 200, Ottawa, Ontario K2P 0B4, Canada. E-mail: danm@trafficinjuryresearch.com.

0749-3797/08/$–see front matter
doi:10.1016/j.amepre.2008.06.015

widely adopted.[8,9] The mobility restrictions inherent in a graduated system were thought to be draconian and unfair, and graduated licensing was not accepted. Moreover, the young driver problem itself did not command public attention. The situation during this period is illustrated by an exchange in the 1980s between the authors of the present article. Mayhew and colleagues,[10] who reviewed the magnitude of the young driver problem in Canada and noted both the failure of existing efforts and the lack of societal commitment to the problem, commented: "Can we continue to justify as a society a continued commitment to a 'status quo' posture, wherein a disproportionate number of young people annually lose their lives or suffer disabling injuries as a result of motor vehicle traffic deaths?" Williams[11] later referred to Mayhew's statement, saying that "to the extent that legislative restrictions on high-risk driving are necessary to rectify the situation, this question can presently be answered in the negative."

Since the mid-1990s, graduated licensing has become very popular, with every state and province enacting some form of it within about a decade. Graduated licensing went from being scorned policy to one of the strongest public health movements ever seen in Canada and the U.S. The reasons for this changeover are not obvious, and possible explanations are necessarily speculative.[12] It is difficult to determine the extent to which the more receptive social climate for graduated licensing in the 1990s was due to secular forces, the cumulative effects of research and advocacy that had been ongoing and strengthening for more than two decades, or the decline in attention to other highway safety issues (such as alcohol-impaired driving) which may have opened the way for the young driver problem to become more dominant.

Other factors may have played a part as well. For instance, there has been increasing recognition that other safety measures, especially driver education, were not effective solutions. There has also been a growing acceptance that we are dealing less with the "young problem driver" (a stance encouraged by penalty-based licensing systems that focus on a few adolescent drivers) but more with the "young driver problem" (a stance that recognizes the heightened vulnerability of all young beginners because of their age and inexperience).[13] The successful introduction of U.S.- and Canadian-style graduated licensing in New Zealand in 1987 may have been a factor. In addition, early evaluations of the New Zealand program and of the initial programs implemented in Canada and the U.S. provided encouraging evidence that graduated licensing prevented crashes involving young drivers and reduced injuries and deaths.[14–17] Finally, it did not hurt that graduated licensing makes good sense as a way to introduce young beginners into the driving population. Graduated licensing was no longer viewed as a draconian system but rather as a protective one that established a more forgiving environment for the learning-to-drive process. The phase-in system protects young beginners while they are learning, as opposed to the prevailing licensing systems which, as Pat Waller noted,[18] "violate everything we know about learning."

Whatever the reasons for its increasing popularity, graduated licensing is now firmly in place as licensing policy in Canada and the U.S., and its success in reducing the young driver problem is well documented in state, provincial, and national studies.[19–21] In the U.S., the number of teenage motor vehicle deaths is at its lowest since 1992, despite the highest number of adolescents in the population since 1977, with particular progress having been made among those aged 16 years, the principal target of graduated licensing.[22] Despite reductions in crashes, the problem remains large. In 2005, U.S. adolescents as a group had higher per capita crash rates than drivers of any other age, and those aged 16 years had a higher per capita rate than drivers aged 30 and older.[22] The situation in Canada is similar to that in the U.S.[23,24]

The fact that young people in graduated systems still crash is not unexpected. Even if all jurisdictions had a "model" program (which they do not) and there were full compliance with graduated licensing provisions (which there is not), crashes would still be expected. Graduated licensing was never meant to be a panacea. It is a compromise and a passive system, still allowing considerable driving at a young age. The problem remains one of higher crash risk because of youth, inexperience (especially in the first few months of licensed driving), and adolescents traveling together, as well as higher injury rates because of lower seatbelt use than adults and the tendency of adolescents to drive older and smaller cars. Clearly, however, graduated licensing has been a major step forward. The question is, where do we go from here? The remainder of this article addresses that question by exploring five promising ideas: raising the licensing age, strengthening graduated licensing laws, increasing compliance with those laws, coordinating graduated licensing and driver education, and improving the testing requirements for graduated licensing.

Raise the Licensing Age

One quick and easy solution to reducing the young driver problem in Canada and the U.S. would be to raise the licensing age to 17. It is known from studies of New Jersey's age-17 licensing law that this would be effective policy. A licensing age of 17 years, plus graduated licensing provisions, as in New Jersey, would produce major reductions in crashes.[25,26] In the past, raising the licensing age has never been seriously considered, even though it is widely supported in surveys of parents.[27,28] Interestingly, recognition that there still is a young driver crash problem—despite the

fact that graduated licensing is effective in reducing crashes—has generated new interest in higher licensing ages. Several states introduced legislation in 2006 and 2007 to raise the licensing age, although none was enacted. Delaying licensure sacrifices some mobility, and it is a societal decision as to where to strike the balance between safety and mobility.

Strengthen Graduated Licensing Laws

Looking around the world at the various ways in which the young driver is being addressed, U.S.- and Canadian-style graduated licensing is about the only policy that demonstrably works.[29] An obvious next step, then, is to try to make it work better. One way that can be accomplished is by strengthening the laws that pertain to graduated licensing.

There has always been considerable variation among U.S. and Canadian jurisdictions in the provisions of the laws, not unexpected when there are 50 states plus the District of Columbia in the U.S. and 10 provinces plus three territories in Canada, all with separate legislative bodies. In terms of the foundation elements of graduated licensing—an extended learner permit period and a period of restrictions on night driving and passengers after initial licensing—some jurisdictions have all of them, others have only one or two, and some have weak elements (e.g., a nighttime restriction that does not begin until 1 AM). In the rating system used by the Insurance Institute for Highway Safety, based primarily on learner period requirements and night and passenger restriction provisions, 31 jurisdictions as of early 2008 were rated as having "good" laws.[30] All jurisdictions having "good" laws is an important goal; however, a "good" rating is achievable even if some components are weak (e.g., a late-starting night restriction or allowing two or more passengers). Optimal provisions that would qualify as an "excellent" law would be a learner permit of at least 6 months, a minimum age of 16 years for the learner permit, a nighttime restriction that begins no later than 10 PM, and a passenger restriction that allows no more than one passenger, with both night and passenger restrictions in force until at least age 18.[31] Although each of these separate provisions exists in multiple jurisdictions, no state or province has the whole optimal package. The current "scorecard" for graduated licensing laws in the U.S. and Canada is provided in Table 1.

It has been established that extended learner periods and nighttime and passenger restrictions all reduce crashes,[20,24] and some evidence shows that graduated systems combining these components result in the greatest reductions.[32,33] It is not an easy task to disentangle the relative contribution of the various graduated licensing components, which typically are introduced simultaneously. However, it is probable that the major effect comes from the extended learner period, primarily through license delay (which reduces driving exposure) and possibly through the acquisition of more extensive pre-license supervised driving experience. Some states and provinces have guaranteed license delay beyond age 16 through a combination of a minimum permit age of 16 and a minimum permit-holding period of several months.

Table 1. Graduated licensing provisions in 64 U.S. states and Canadian provinces[a]

Provisions	Number of states/ provinces
16-year-old minimum permit age	16
Permit-holding period of at least 6 months	58
Suboptimal nighttime restriction (11 PM or later)	41
Optimal nighttime restriction (10 PM or earlier)	9
Suboptimal passenger restriction (two or more)	10
Optimal passenger restrictions (none or one)	39
Night and/or passenger restrictions until at least age 18	14

[a]As of April 2008

There had been concern that, once states and provinces enacted their original legislation, the focus would shift to other highway safety issues and interest in the young driver problem would wane.[34] That has not been the case. Many states and provinces have amended their laws, some multiple times, and this trend is continuing. A recent phenomenon is the addition of a provision banning cell phone use, an understandable development given that we are currently in the era of the "distracted" driver. Distraction is a particular problem for young beginners, who are also attracted to new technology such as cell phones.[35] Some of the amendments have been trivial, but overall, this trend has resulted in stronger laws. It is important, though, that states and provinces concentrate on adding or upgrading the core elements of graduated licensing—nighttime and passenger restrictions and an extended learner period—and on not allowing the licensing process to begin until age 16.

In addition to adding or upgrading graduated licensing provisions, it is also important to clean out inconsistencies or illogical provisions. For example, in Ontario and Kentucky, attempts to enact a nighttime restriction for initial-license holders failed, but there is such a restriction for learner-permit holders. This situation prevents young novices from practicing at night as a learner but gives them immediate access to late-night, unsupervised driving upon licensure. Ontario at least partially rectified this situation by enacting in 2005 a late-night passenger restriction in the intermediate stage of its program.[36]

Another example of an illogical provision is the "time discount" that some states and provinces have for driver

education graduates, allowing them to spend less time in the graduated system. This occurs in graduated driver licensing (GDL) programs based on time in the system and not age—a typical situation in Canada—in which the minimum holding period in the learner stage, for example, is reduced from 6 months to 3 months. Given that driver education is not associated with crash reductions, this favoritism lacks justification.[37] Moreover, several evaluation studies in Ontario, Nova Scotia, and British Columbia have reported that the time discount for driver education increases, rather than decreases, the risk for novice drivers. Drivers who received the time discount had higher crash rates than those who did not: 45% more crashes in Ontario, 27% more in Nova Scotia, and 45% more in British Columbia.[15,38,39] Mayhew and colleagues[40] also reported that the time discount for driver education had a dramatic negative impact on the crash rates of Ontario novice drivers, a finding consistent with interim results reported earlier by Boase and Tasca.[15] A more recent study in Quebec also found that adolescents who use the time discount for driver education have higher crash rates than other adolescent drivers.[41] Given these consistent findings, there is no justification for offering a time discount for taking driver education. In recognition of this fact, the 3-month time discount in the learner phase (9 months instead of 12 months) has been eliminated in British Columbia, although time discounts in other provinces and states remain in effect.

Another area for law change applies to the U.S. only. Graduated licensing is a system for dealing with driving inexperience, a risk factor for all novices, and in Canada and New Zealand the system applies to novices whatever their age. However in the U.S., with two exceptions, graduated licensing rules apply only to those who have not reached age 18. Teenagers who are aged ≥18 when they begin to drive do not have to go through graduated licensing; if they turn 18 while in the system, they automatically graduate. Only Maryland and New Jersey apply some graduated licensing provisions to drivers aged >18. For example, in New Jersey, the law applies to drivers of all ages, although nighttime and passenger restrictions are waived for new drivers aged ≥21.

Most novice drivers are young, so applying graduated licensing only to those aged <18 may miss relatively few beginners. However, crash risk is elevated among older adolescents, and older beginners have higher crash risk than older experienced drivers; these findings justify application of the program to all beginners, as is done in Canada.[2,42]

Increase Compliance with Graduated Licensing Laws

Another way to build on graduated licensing is to maximize compliance with the laws. Compliance with graduated licensing provisions is an issue, especially with passenger restrictions, and it is axiomatic that the stronger the law, the less it will be obeyed. Thus, efforts to strengthen the laws need to be accompanied by efforts to improve compliance. The challenge lies in formulating a law that is suitably strong but that makes sense to parents, police, and adolescents. Achieving this goal would likely improve voluntary compliance in families and also motivate police to enforce the provisions when necessary. There is considerable evidence that parents and police highly approve of graduated licensing and that adolescents are less in favor but understand the rationale for it.[43,44] However, campaigns to better explain the provisions and their rationale—to "sell" graduated licensing to the greater community as a protective strategy—may have some payoff. Such a "public consultation" strategy is often put in place prior to the implementation of graduated licensing, but little else is done to sustain or enhance public awareness and foster continued understanding and support beyond the effective date of the program.

Parents

Parents are the chief overseers of the licensing process in their families and the driving their adolescents do. In fact, in all states and most provinces, parental consent is required for adolescents aged <18 to obtain a learner's permit. Graduated licensing both simplifies and complicates matters for parents. Prior to graduated licensing, parents were pretty much on their own about how to handle licensing, having to make up their own rules. Graduated licensing gives parents a set of rules and restrictions most would want anyway and makes the rules law, thus empowering parents. Parental oversight of teen driving involves not just the enforcement of compliance with existing rules but also, ideally, the setting of higher family standards that go beyond the legal baseline. The extent to which parents understand and perform this dual task is not yet clear. However, research has shown that parents are prepared to impose restrictions in support of, and consistent with, the safety goals of graduated licensing.[24,45,46] These findings suggest that parents might be receptive to doing more to manage their adolescent's driving and to safeguard them from crash risk.

Parental behavior with regard to the licensing and early driving of their adolescent is affected by the amount of time parents have available, their motivation to be involved, parenting styles, and knowledge about relevant highway safety issues. Thus, a broad range of approaches to parental management of teen driving exists. In terms of programs attempting to influence parents to establish or enforce graduated licensing rules, results have been mixed.[47–49] It is known that parenting styles are important in influencing crash risk, but changing parenting styles is not easy. Attempts to improve parental management of teen driving are

further complicated when parents do not drive safely. Research suggests that teens' driving behavior reflects their parents' driving behavior and that the factors giving rise to poor driving by parents also have a significant influence on their adolescents.[24,50–52] Some parents need to be convinced that they should be positive role models, especially in terms of their own driving behaviors. But this attitude change would likely be difficult to accomplish. Parental roles and responsibilities in teen driving are addressed by another article in this supplement.[53]

There may be more payoff in improving parent's knowledge about highway safety issues than in trying to change parenting styles. Two issues of importance have to do with the type of vehicle adolescents drive and the safety value of driver education, including driver training courses that teach skid control and other emergency maneuvers. It is known that young beginners tend to drive older and smaller cars—vehicles that are less protective in a crash—than do adults.[54] This phenomenon is largely a matter of economics. Thus, providing parents with better knowledge about how best to balance safety and cost might improve the vehicle choices they make for their adolescents. Parents also need to be better informed about the safety value of driver education. Parents generally believe that driver education will train their children to drive safely. This belief may help explain why young novices taking driver education have fewer total hours of driving practice before licensing than those not taking driver education.[24] Driver education programs, however, have yet to demonstrate that they can produce drivers less likely to crash than drivers without formal training. As a consequence, parents should not rely on driver education as a substitute for supervised driving practice. The issue with courses teaching skid control is that research in both Scandinavia and the U.S. has indicated that young people who take such courses, particularly young men, have more crashes subsequently than comparable people without the training.[55–57] The higher crash rates are thought to be largely the result of overconfidence and showing off to friends. Despite initial negative findings, programs providing such training (sponsored by police, manufacturers, and other organizations) have proliferated in Canada and the U.S. in recent years. Evaluations of these programs are needed to determine how the training affects crash rates. Pending the results of such research, parents need to be warned about the negative findings of previous studies.

One developing technique that can affect the driving behavior of teenagers involves in-vehicle monitoring. Devices are now available, or soon will be, that can provide feedback to parents on vehicle speed and acceleration, locate where the driver is, and tell about vehicle occupancy.[58] Such information allows parents to know if the vehicle is being driven in an aberrant manner and whether night and passenger restrictions are being violated. Few parents use these devices presently, and their popularity is likely to be further limited by the "trust" issue (the notion that parents are "spying" on their adolescents). Yet these devices will become more sophisticated at assessing aberrant behavior. When they are marketed as learning devices (i.e., pointing out errors the beginning driver is making), their popularity will likely increase.

Police

Police obviously have an important role in enhancing compliance with graduated systems. However, police have been insufficiently involved, in part because of various enforcement difficulties. In some cases police are unfamiliar with the specifics of the law and how to cite drivers for violations. For example, in some jurisdictions police can't tell whether the driver they have stopped is in the graduated system because this is not indicated on the license.[43,59] Remedies for these problems include requiring the vehicle of a novice driver to display an "L" sign for learner or an "N" sign for novice driver. But the extent to which these actions help the police enforce graduated licensing provisions is not known in the few jurisdictions where this requirement applies. It is also important to get police more involved. The one study that used police as both educators and enforcers showed very modest positive effects.[60] Nevertheless, this initial study can serve as a learning experience to guide future program efforts.

The few compliance programs involving parents or police that have been tried and evaluated thus far have been insufficiently effective.[47–49,60] A next stage would be to combine the efforts of parents and police in a coordinated program aimed at maximizing compliance. The combined efforts of parents and police should be mutually reinforcing. It is known that while parents understand they are first in line in enforcing graduated licensing provisions, they want police involved in enforcement to support and validate their own efforts. In turn, police are more likely to be motivated to enforce if they know they have the backing and assistance of parents.[61]

Adolescents

Besides parents and police, adolescents themselves are key players in determining whether or not graduated licensing and parental rules are followed and, ultimately, whether the graduated licensing program succeeds. Few programs have addressed adolescents directly, but more should be tried and evaluated.[60] It is interesting to note that, in the police enforcement program in North Carolina that had only modest overall effects, the most success was achieved at a school in which students got involved through such activities as running their own checkpoints, giving

out mock tickets to violators of graduated licensing provisions, and rewarding compliant drivers with restaurant coupons. Programs involving a sophisticated peer-to-peer approach to motivate safe driving, such as the program developed by Allstate Insurance, need to be evaluated.[62]

A major problem involves adolescents traveling with other adolescents, a behavior associated with a high risk of crashes, especially when male passengers are present. Crash deaths involving such behavior have been reduced by graduated licensing but remain high. In the U.S. in 2005, 46% of the fatal crashes involving drivers aged 16 years and 39% of those involving drivers aged 17 years occurred when drivers of these ages were transporting other adolescents, with no older occupant present. The greatest challenge and opportunity for young driver programs is to try to affect teenagers' choice of travelling companions and how they comport themselves in vehicles. These behaviors are not easily monitored by parents, although in-vehicle technology may provide a means to do so. Passenger restrictions are key. But even with optimal passenger-restriction provisions in place in all jurisdictions, some young people will still travel together. Peer-to-peer programs have been successful in some realms,[63] and it is worth designing and testing programs that address these important issues. Lessons may also be learned from other countries that have tried to deal with this problem. For example, an education/enforcement program in Norway that encouraged adolescents to challenge drivers who were misbehaving was associated with a decrease in passenger injuries and deaths.[64] This program should be tried elsewhere.

Coordinate Graduated Licensing and Driver Education

Graduated licensing and driver education are both popular policies. One works to reduce crashes, the other presently does not. These policies co-exist but they are seldom coordinated. Is there a way to integrate these policies to enhance the benefits of both? This is a major challenge that needs to be addressed and one that has received some attention, but not much action, in graduated licensing programs in Canada and the U.S. Indeed, the National Highway Traffic Safety Administration recommended a two-phase driver education program as part of graduated licensing over a decade ago.[65] Such a program would involve an initial phase to teach basic vehicle handling skills and rules of the road and a second phase to teach safe driving procedures, including perceptual and decision-making skills. This notion of multistage driver education had actually been raised several years earlier by McKnight, who observed that it may be advisable to introduce more safety-oriented driver training following initial licensing and after some driving experience has been gained.[66] Consistent with the multistage structure of graduated licensing, phase one would occur during the learner stage and phase two during the intermediate stage of this licensing process.

Although a multistage approach is appealing on logical grounds, Michigan is the only jurisdiction to adopt such a two-phase driver education program. (The program's independent contribution to the success of the overall graduated licensing effort has not yet been investigated.) Governments responsible for graduated licensing in Canada and the U.S. have not embraced the notion of multistage driver education. Although the reasons for this governmental reluctance are not clear, the multiphase approach needs further consideration, particularly if serious efforts are made to improve driver education.

As suggested earlier, driver education should not be used as a substitute for supervised practice, which is a low-risk activity. The role of driver education should include encouraging the teen to acquire more supervised driving practice. It should also encourage the instructor to work cooperatively with parents to engage them further in the learning process and to structure how practice unfolds systematically, from simple to more complex and demanding driving situations. For example, initial driving should take place during daylight hours on familiar residential streets before progressing to nighttime driving on unfamiliar roads with higher speed limits. Working as a team, parents and driving instructors can play an important role in shaping and influencing the adolescents' safety attitudes and acquisition of driving skills, as well as maximizing the quantity and quality of driving experience gained.

Some driver education programs in Canada, the U.S., and elsewhere have recognized the potential benefits of driving instructors partnering with parents by, for example, inviting parents to attend an in-class lesson with their adolescent. In Australia, the Royal Automobile Club of Victoria recently developed the Parent Plus program, which initially invites the parent supervising the adolescent driver to attend an on-road lesson, as a back-seat observer, with the learner and a professional driving instructor.[67] The supervising parent is then encouraged to attend further free lessons tailored to the needs of both the learner and the supervisor. The driving instructor serves as a mentor for both the learner and the supervisor. Several information brochures relevant to each stage of learner development are also provided to the supervising parent before, during, and 2 months after the Parent Plus lesson. According to Johnson and Christie,[67] parents who actively participate in the program report being more likely to provide greater levels of supervised on-road experience for their learners. Such programs need to be more closely examined and encouraged if they are found to have a positive influence on the

quantity and quality of supervised driving practice and, consequently, the quantity and quality of pre-license driving experience.

Although it is reasonable to assume that a lengthier learner period and more hours of supervised practice should produce greater safety benefits, there may also be a point of diminishing returns. This is an important issue because parental support for a lengthier learner stage could be jeopardized if such changes are perceived as unreasonable and/or create undue inconveniences. At issue as well is the optimal minimum number of hours of certified driving practice required overall and at night. The current requirements of 30–50 hours of certified practice (10 hours at night) should have safety benefits but may underestimate the actual amount of practice needed to become a proficient and safe driver. In this regard, Oregon requires 100 hours of supervised driving (50 hours if driver education has been taken), and some Australian states are planning to require a minimum of 100 or 120 hours of supervised driving for learners. A related issue is the optimal number of on-road driving hours within a formal driver education program, especially if it is partnered with increased supervised parental driving practice.

Even if driver education is better coordinated with the structure of graduated licensing by being multistaged and by partnering with parents for supervised driving practice, such programs may not achieve their potential without further improvements to their content and delivery.[68] Driver education should also use the best teaching methods and learning principles, such as computer-based instruction and driving simulation that provide a protected way of exposing adolescents to the hazardous driving situations that contribute most to elevated crash risk. These methods provide a more efficient and possibly more effective means of transferring knowledge, attitudes, and skills than do didactic lectures and dated safety videos.[69] On-road teaching techniques, such as commentary driving (having novice drivers comment on the hazards and factors they take into account while driving), and in-car technologies (e.g., systems that warn about unsafe driving such as speeding) to train and monitor young drivers should also be considered. It is important as well to match the learning experiences to the novices' needs and skill level, which speaks to better testing and diagnostic assessments by means of, for example, improved driving tests and computer-based training and testing.[70,71]

Improve Testing Requirements for Graduated Licensing

Testing requirements have generally been carried over from the time before graduated licensing, but tests can be changed to better support graduated licensing goals. Typically, jurisdictions require learners to successfully pass an on-road driving test, which is designed to ensure that people who drive motor vehicles on highways are competent drivers and are aware of safe driving practices and road law. Thus, the test sets the minimum standards for "safe" driving and provides a means to ascertain if someone has achieved that standard and can now become fully licensed.

In Canada and the U.S., the basic road test focuses primarily on assessing performance and skills in operating the vehicle. Most current road tests have been in place for many years, and some are based on the Automobile Driver On-Road Performance Test (ADOPT) developed by McPherson and McKnight for the National Highway Traffic Safety Administration.[72]

The advent of GDL has stimulated some interest in improving the basic road test to incorporate elements of hazard perception. This has been done in other countries. For example, a computer screen-based hazard perception test was developed in the late 1980s and is in use in Victoria, Australia.[73] The original intention was to use the test at the end of the graduated licensing period (3 years in Victoria) as an exit test. For a variety of reasons this test is used at the time of the basic road test to qualify for a license to drive unsupervised.[74] Research shows that this hazard perception test was able to predict those novice drivers likely to be involved in casualty crashes.[75,76] There have also been recent developments in screen-based computerized testing in New South Wales and in road testing in New Zealand that incorporate elements of hazard perception.[77] A screen-based computerized hazard perception test also forms a second section of the theory test in the UK and must be passed by learners at the same time as the theory test.

In Canada and the U.S. there are limited examples of changes in driver testing. The implementation of GDL in British Columbia prompted the design of both an improved basic road test and an advanced exit road test. Hazard perception is included as part of the basic road test. A new Driving Performance Evaluation Road Test implemented by California, developed prior to graduated driver licensing, is longer than most other road tests (about 25 minutes compared with 10–15 minutes for the ADOPT). Although this new test was found to have construct validity,[78] a large-scale, well designed field experiment failed to find any reduction in collision involvement resulting from implementation of the program.[79] Earlier evaluations of basic road tests have also failed to find any significant safety benefits.[80]

Ontario was actually the first jurisdiction to adopt an advanced on-road "exit" test for passenger vehicle drivers when graduated licensing was implemented there in 1994, several years before implementation of the graduated licensing program in British Columbia. This exit test, more stringent and demanding than the

basic road test, was adapted from a U.S. commercial driver performance test developed by Townsend and colleagues.[81,82] Ontario's exit test is administered to novices who have completed the requirements of the second level of the graduated licensing program and wish to obtain a full license. Thus, the novice must pass the advanced road test to graduate from the intermediate stage to a full, unrestricted license. The function of such an exit test is to ensure that novice drivers have the requisite abilities to operate on the roads with acceptable safety before being granted a full license. The test is intended to motivate novice drivers to practice driving and to ensure they acquire and demonstrate the requisite overall skills to progress to a full license. This assumes that novice drivers want to graduate from the intermediate stage and progress to a full license so they are no longer subject to the conditions/restrictions of the program, in other words, that they value achieving full, unrestricted driving privileges. If novice drivers fail to practice and develop safe driving skills, they will be unprepared for the advanced test, fail it, and, consequently, remain in the graduated licensing program until they retake the test and pass it.

Although an advanced on-road exit test in a graduated licensing program has considerable theoretical and logical appeal, its safety value has not been established because only a limited number of such tests are in operation—in Ontario, British Columbia, Alberta, and New Zealand. These tests also have not been evaluated because some have only been recently introduced. As mentioned previously, the basic road tests that have been evaluated, including the Driver Performance Evaluation in California, have generally failed to find any significant safety benefits.[79,80,83] By contrast, a computerized test developed and used in Victoria, Australia—the Hazard Perception Test (HPT)—was able to predict those novice drivers likely to be involved in casualty crashes.[75,76] Although this finding is promising, particularly given that the HPT was initially intended as an exit test, it comes from only one recent study and an earlier pilot trial. Further studies are needed to replicate this finding elsewhere and to determine the safety effectiveness of not only the HPT or other types of computer-based, higher-order skills testing but also on-road advanced tests applied to novices exiting from an intermediate stage of graduated licensing to a full license. Given the limited state of knowledge about these tests, it is not yet possible to identify on-road or computer-based tests that have potential for contributing to the safety benefits of a graduated licensing system. However, hazard perception testing may hold promise, and a more advanced on-road or computer-based exit test (in addition to the basic road test) is worth further consideration.

Discussion and Summary

After remaining in the background for many years, the young driver problem in Canada and the U.S. has come to the fore. The widespread adoption of graduated licensing, beginning in the mid-1990s, has reduced the problem. Now that these initial gains have been documented, there is growing realization that, although reduced, the young driver problem is still major, and more needs to be done to address it.

Graduated licensing is an important building block in this effort. Although elements of graduated licensing exist in every U.S. and Canadian jurisdiction, program features vary tremendously, and every law could be strengthened. In doing so, the greatest attention needs to be paid to upgrading the core components of graduated licensing known to make a difference: the extended learner stage, nighttime restrictions, and passenger restrictions. In reviewing present laws, it is also important to identify and remove illogical or harmful provisions, such as time discounts for driver education graduates. Opportunities also exist to supplement laws with tougher and more advanced testing requirements, which have the potential both to improve driving performance and to delay licensure.

Compliance with the provisions of graduated licensing is also an issue. Many opportunities are identified in this article for improving compliance, primarily through programs involving parents, police, and adolescents themselves. To the extent that such programs have been tried, typically these groups have only been addressed one at a time. However, a more comprehensive, community-based program involving parents, police, adolescents, and other community groups may prompt greater success.

Perhaps the greatest challenge is to coordinate graduated licensing and driver education—two popular and co-existing policies—in ways that yield increased reductions in crashes. Several opportunities for doing so have been discussed, and they need further development and testing. This need underscores an essential point: We have an evidence-based policy (graduated licensing) in place, and every improvement we try needs to build on graduated licensing and be scientifically validated before it becomes widely adopted.

No financial disclosures were reported by the authors of this paper.

References

1. Williams AF, Weinberg K, Fields M, Ferguson SA. Current requirements for getting a drivers license in the United States. J Safety Res 1996;27:93–101.
2. Mayhew DR, Simpson HM. New to the road, young drivers and novice drivers: similar problems and solutions? Ottawa: Traffic Injury Research Foundation, 1990.
3. Williams AF, Preusser DF, Ulmer RG, Weinstein HB. Characteristics of fatal crashes of 16-year-old drivers: implications for licensure policies. J Public Health Policy 1995;16:347–60.

4. Mayhew DR, Donelson AC, Beirness DJ, Simpson HM. Youth, alcohol and relative risk of crash involvement. Accid Anal Prev 1986;18:273–87.
5. Waller PF. Challenging the status quo in driver licensing. Traffic Safety 1976;76:20–1.
6. Warren RA, Simpson HM. The young driver paradox. Ottawa: Traffic Injury Research Foundation, 1976.
7. Croke A, Wilson WB. Model for provisional (graduated) licensing of young novice drivers. Contract No. DOT HS-6-01384. Springfield VA: Technical Information Services, 1977.
8. Hagge RA, Marsh WC. An evaluation of the traffic safety impact of provisional licensing. Sacramento CA: Department of Motor Vehicles, 1988.
9. McKnight AJ, Hyle P, Albrecht L. Youth license control demonstration project. National Highway Traffic Safety Administration. Springfield VA: National Technical Information Services, 1983. Report No. DOT-HS-7-01765.
10. Mayhew DR, Warren HM, Simpson HM, Haas GC. Young driver accidents: magnitude and characteristics of the problem. Ottawa: Traffic Injury Research Foundation, 1981.
11. Williams AF. Effective and ineffective policies for reducing injuries associated with youthful drivers. Alcohol Drugs Driving 1987;3:109–17.
12. Williams AF. The fall and rise of graduated licensing in North America. In: Implementing impaired driving countermeasures: putting research into action. Transportation Research Circular Number E-C072. Washington DC: Transportation Research Board, 2005:143–9.
13. Simpson HM, ed. New to the road: reducing the risks for young motorists. Los Angeles: Youth Enhancement Service, 1996.
14. Frith WJ, Perkins WA. The New Zealand graduated driver licensing system. National Road Safety Seminar. Wellington, New Zealand: Land Transport, 1992. Papers 2:256–78.
15. Boase P, Tasca L. Graduated licensing system evaluation: interim report. Toronto: Safety Policy Branch, Ontario Ministry of Transportation, 1998.
16. Ulmer RG, Preusser DF, Williams AF, Ferguson SA, Farmer CM. Effect of Florida's graduated licensing program on the crash rate of teenage drivers. Accid Anal Prev 2000;32:527–32.
17. Mayhew DR. Licensing systems for controlling the risks of young motorists. In: Simpson H, ed. New to the road: reducing the risks for young motorists. Los Angeles: UCLA, 1996:79–85.
18. Waller PF. The genesis of GDL. J Safety Res 2003;34:17–23.
19. Shope JT. Graduated driver licensing: review of evaluation results since 2002. J Safety Res 2007;38:165–75.
20. Williams AF. Contribution of the components of graduated licensing to crash reductions. J Safety Res 2007;38:177–84.
21. Simpson HM. The evolution and effectiveness of graduated licensing. J Safety Res 2003;34:25–34.
22. Ferguson SA, Teoh ER, McCartt AM. Progress in teenage crash risk during the last decade. J Safety Res 2007;38:137–45.
23. Mayhew DR, Singhal D, Simpson HM, Beirness DJ. Deaths and injuries to young Canadians from road crashes. Ottawa: Traffic Injury Research Foundation, 2004.
24. Mayhew DR, Simpson HM, Singhal D, Desmond K. Reducing the crash risk for young drivers. Washington DC: AAA Foundation for Traffic Safety, 2006.
25. Williams AF, Karpf RS, Zador PL. Variations in minimum licensing age and fatal motor vehicle crashes. Am J Public Health 1983;73:1401–3.
26. Ferguson SA, Leaf WA, Williams AF, Preusser DF. Differences in young driver crash involvement in states with varying licensure practices. Accid Anal Prev 1996;28:171–80.
27. Williams AF, Lund AK. Adults views of laws that limit teenagers' driving and access to alcohol. J Public Health Policy 1986;7:190–7.
28. Ferguson SA, Williams AF. Parents' views of driver licensing practices in the United States. J Safety Res 1996;27:73–81.
29. Organisation for Economic Co-operation and Development; European Conference of Ministers of Transport. Young drivers, the road to safety. Paris: Transport Research Centre, 2006.
30. Insurance Institute for Highway Safety. Graduated driver licensing. www.iihs.org/laws/pdf/us_licensing_systems.pdf.
31. Insurance Institute for Highway Safety. Graduated licensing: a blueprint for North America. Arlington VA: Insurance Institute for Highway Safety, 2004.
32. Chen L, Baker SP, Li G. Graduated driver licensing programs and fatal crashes of 16-year-old drivers. Pediatrics 2006;118:56–62.
33. Baker SP, Chen L, Li G. Nationwide review of graduated driver licensing. Washington DC: AAA Foundation for Traffic Safety, 2007.
34. Williams AF. Next steps for graduated licensing. Traffic Inj Prev 2005;6:199–201.
35. Lee J. Technology and teen drivers. J Safety Res 2007;38:203–13.
36. Mayhew DR, Simpson HM, Singhal D. Best practices for graduated licensing in Canada. Ottawa: Traffic Injury Research Foundation, 2005.
37. Mayhew DR. Driver education and graduated licensing in North America: past, present and future. J Safety Res 2007;38:229–35.
38. Mayhew DR, Simpson HM, Desmond K, Williams AF. Specific and long-term effects of Nova Scotia's graduated licensing program. Traffic Inj Prev 2003;4:91–7.
39. Wiggins S. Graduated licensing program: interim evaluation report–year 3. Victoria, Canada: Insurance Corporation of British Columbia, 2004.
40. Mayhew DR, Simpson HM, Pak A. Ontario graduated licensing system evaluation—2002. Toronto: Ontario Ministry of Transportation, 2002.
41. Hirsch P, Maag U, Laberge-Nadeau C. The role of driver education in the licensing process in Quebec. Traffic Inj Prev 2006;7:130–42.
42. Simpson HM, Mayhew DR. Reducing the risks for new drivers: a graduated licensing system for British Columbia. Ottawa: Traffic Injury Research Foundation, 1992.
43. Goodwin AH, Foss RD. Graduated driver licensing restrictions: awareness, compliance, and enforcement in North Carolina. J Safety Res 2004; 35:367–74.
44. Williams AF, Nelson LA, Leaf WA. Responses of teenagers and their parents to California's graduated licensing system. Accid Anal Prev 2002; 34:835–42.
45. McCartt AT, Shabanova VI, Leaf WA. Driving experience, crashes, and traffic citations of teenage beginning drivers. Accid Anal Prev 2003; 35:311–20.
46. Hartos JL, Simons-Morton BG, Beck KH, Leaf WA. Parent-imposed limits on high-risk adolescent driving: are they stricter with graduated driver licensing. Accid Anal Prev 2005;37:557–62.
47. Chaudhary N, Ferguson SA, Herbel S. Tennessee's Novice Driver Safety Project: a program to increase parental involvement. Traffic Inj Prev 2004;5:356–61.
48. Goodwin AH, Waller MW, Foss RD. Parental supervision of teen drivers in a graduated licensing system. Chapel Hill NC: University of North Carolina Highway Safety Research Center, 2006.
49. Simons-Morton BG, Ouimet MC. Parent involvement in novice teen driving: a review of the literature. Inj Prev 2006;12(Suppl 1):i30–7.
50. Ferguson SA, Williams AF, Chapline JF, Reinfurt DW, De Leonardis DM. Relationship of parent driving records to the driving records of their children. Accid Anal Prev 2001;33:229–34.
51. Bianchi A, Summala H. The "genetics" of driving behavior: parents' driving style predicts their children's driving style. Accid Anal Prev 2004;36:655–9.
52. McKay MP, Coben JH, Larkin GL. Driving beliefs and behaviors of novice teen drivers and their parents: implications for teen driver crash risk. In: 47th Annual Proceedings of the Association for the Advancement of Automotive Medicine, Sept 22–24, 2003, Lisbon, Portugal. Barrington IL: Association for the Advancement of Automotive Medicine, 2003.
53. Simons-Morton B, Ouimet MC, Catalano RF. Parenting and the young driver problem. Am J Prev Med 2008;35(3S):S294–S303.
54. Williams AF, Leaf WA, Simons-Morton BG, Hartos JL. Vehicles driven by teenagers in their first year of licensure. Traffic Inj Prev 2006;7:23–30.
55. Glad A. Phase 2 driver education, effect on accident risk. Oslo: Norway Transport Institute, 1988.
56. Jones B. The effectiveness of skid-car training for teenage novice drivers in Oregon. Salem OR: Driver and Motor Vehicle Services, 1993.
57. Katila A, Keskinen E, Laapotti S, Hatakka M. Changes in slippery road accidents as an effect of renewed driver training in Finland. Turku, Finland: University of Turku, 1995.
58. National Highway Traffic Safety Administration. Summary report: workshop on vehicle technologies to aid teen drivers. Washington DC: U.S. Department of Transportation, 2005. Report No. DOT HS 810 612. www.nhtsa.dot.gov/staticfiles/DOT/NHTSA/NRD/Multimedia/PDFs/Human%20Factors/Reducing%20Unsafe%20behaviors/DOT%20HS%20810%20612.pdf.
59. Chaudhary NK, Williams AF, Nissen W. Evaluation and compliance of passenger restrictions in a graduated licensing program. Washington DC: National Highway Traffic Safety Administration, 2007. Report No. DOT HS 810 781.
60. Goodwin AH, Wells JK, Foss RD, Williams AF. Encouraging compliance with graduated driver licensing restrictions. J Safety Res 2006;37:343–51.
61. Raymond P, Johns M, Golembiewski G. Evaluation of Oregon's graduated driver licensing program. Washington DC: National Highway Traffic Safety Administration, 2004. DTNH22-99-D-15099.
62. Allstate Foundation. Chronic: a report on the state of teen driving 2005. http://www.allstate.com/content/refresh-attachments/citizenship/chronic.pdf.

63. Gottfredson DC, Wilson DB. Characteristics of effective school-based substance abuse prevention. Prev Sci 2003;4:27–38.
64. Elvik R. Evaluating the effect of Norway's "Speak Out!" road safety campaign: the logic of causal inference in road safety evaluation studies. Trans Res Rec 2000;1717:66–75.
65. National Highway Traffic Safety Administration. Research agenda for an improved novice driver education program. Report to Congress. Washington DC: U.S. Department of Transportation, 1994. www.nhtsa.dot.gov/people/injury/research/pub/drive-ed.pdf.
66. McKnight AJ. Driver education—when? In: Mayhew DR, Simpson HM, Donelson AC, eds. Young driver accidents: in search of solutions. Proceedings of an International Symposium. Ottawa: Traffic Injury Research Foundation, 1985:109–15.
67. Johnson P, Christie S. Strengthening the learner driver experience through parent involvement and education. Victoria, Australia: Royal Automobile Club of Victoria, 2005.
68. Mayhew DR. The future of driver education. In: Driver education: the path ahead. Transportation Research Circular Number E-C101. Washington DC: Transportation Research Board, 2006:17–8.
69. Brock JF. Instructional methods for young drivers. In: Driver education: the path ahead. Transportation Research Circular Number E-C101. Washington DC: Transportation Research Board, 2006:7–8.
70. Lonero L. Student competency measures. In: Driver education: the path ahead. Transportation Research Circular Number E-C101. Washington DC: Transportation Research Board, 2006:9–11.
71. Groeger JA, Brady SJ. Differential effects of formal and informal driver training. London: Department of Transport, 2004. Road Safety Research Report No. 42.
72. McPherson K, McKnight AJ. Automobile on-road performance test. Volume I: final report. Washington DC: U.S. Department of Transportation, National Highway Traffic Safety Administration, 1981. Report No. DOT HS 806 207.
73. Hull M. Mandatory hazard perception test as a means of reducing casualty crashes amongst novice drivers. Victoria, Australia: VicRoads, 1991. Report DP 91/3.
74. Christie R. Driver licensing requirements and performance standards including driver and rider training. Melbourne: National Road Transport Commission, 2000.
75. Hull M, Christie R. The hazard perception test: the Geelong trial and future development. Melbourne: VicRoads, 1993. Report No.: GR 93-13.
76. Congdon P. VicRoads Hazard perception test, can it predict accidents? Camberwell, Australia: Australian Council for Educational Research, 1999.
77. Christie R, Fabre J, Johnston D, et al. Development of full licence test for New Zealand. In: Road Safety Research, Policing, Education Conference, Nov 16–17, 1998, Wellington, New Zealand. Proceedings Vol. 2:48–52.
78. Romanowicz PA, Hagge RA. An evaluation of the validity of California's driving performance evaluation road test. Sacramento CA: California Department of Motor Vehicles, 1995. Report 154.
79. Gebers MA, Romanowicz PA, Hagge RA. An evaluation of the impact of California's driving performance evaluation road test on traffic accident and citation rates. Sacramento CA: California Department of Motor Vehicles, 1998. RSS-98-181.
80. Mayhew D, Christie R, Nickel WR, Simpson HM. Advanced exit tests in graduated driver licensing programs. Toronto: Ontario Ministry of Transportation, 2001 (unpublished).
81. Townsend M, Engel R, Andersen J. Development of the level-2 driver license tests for class M and G. Toronto: Ministry of Transportation, Safety Research Office, 1995. SRO-95-105.
82. Townsend M, Engel R, Andersen J, Clifford L. Search for an advanced novice driver license test. Toronto: Ministry of Transportation, Safety Research Office, 1993. SRO-93-104.
83. MacDonald WA. Driving performance measures and license tests: a literature review. Canberra: Department of Transport, 1987. CR 57.