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Graduated driver licensing: An international review

Abstract

Graduated Driver Licensing aims to gradually increase the exposure of new drivers to more complex driving situations and typically consists of learner, provisional and open licence phases. The first phase, the learner licence, is designed to allow novices to obtain practical driving experience in lower risk situations. The learner licence can delay licensure, encourage learning to drive under supervision, mandate the number of hours of practice required to progress and encourage the involvement of parents. The second phase, the provisional licence, reduces new drivers’ exposure to risky driving in situations such as at night, with passengers, or after drinking alcohol, by putting various driving restrictions in place. Parental involvement with Graduated Driver Licensing appears essential in helping novices obtain sufficient practice and enforcing compliance with restrictions once the new driver obtains a provisional licence.

Keywords: traffic accidents; public health; accident prevention; safety; automobile driving

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Graduated driver licensing (GDL) systems use a public health approach to reduce crash risk by focusing on reducing risk for new drivers as a group rather than the risk of individual drivers.\(^1\)\(^,\)\(^2\) These systems minimise the exposure of novice drivers to risky situations, while allowing them to obtain experience as drivers.\(^3\)\(^,\)\(^4\) The purpose of GDL is to gradually introduce new drivers to more complex driving environments as they gain experience.\(^4\)\(^,\)\(^5\)

Typically, there are three stages in a GDL system: learner phase, intermediate or provisional stage, and full licence.\(^6\) As new drivers demonstrate their experience in less demanding stages, restrictions are lifted and new driving privileges introduced.\(^7\) The learner phase allows the new driver to develop driving skills under the supervision of a more experienced driver,\(^8\) while a provisional licence allows solo driving subject to restrictions.\(^9\) A GDL system is not designed to reduce deliberate risk taking by new drivers. Instead, it reduces crash risk caused by inexperience.\(^10\)

New Zealand introduced the first GDL system in 1987 and since then its popularity has grown, with jurisdictions within Australia, New Zealand, the United States of America (USA), and Canada introducing forms of GDL.\(^4\)\(^,\)\(^5\) An increasing number of evaluations of GDL systems indicate that this countermeasure is effective in reducing crash risk.\(^11\)\(^-\)\(^14\) In the USA, the introduction of GDL systems has reduced the crash risk of the youngest newly licensed drivers by 20 to 40 percent.\(^15\) Even when a basic GDL system is introduced, research indicates that it reduces fatal crash involvement for 16 and 17 year old drivers when compared with slightly older drivers. More comprehensive GDL systems result in larger crash reductions.\(^11\) The available evidence suggests that when GDL systems only apply to drivers aged up to 17 year old drivers, an increase in crashes for drivers aged 18 or 19 can occur. Thus, there may be advantages in applying GDL systems to older novice drivers.\(^16\)
Research suggests that GDL programs are beneficial both for the young licensed driver and other road users.\textsuperscript{17} Evaluations of the New Zealand GDL system that occurred immediately after its introduction demonstrated a reduction in casualty crashes of 25 percent.\textsuperscript{18} However, the reduction in young driver crashes as a result of a GDL system may differ across racial or ethnic groups.\textsuperscript{19}

Within the Australian states of Queensland and Victoria, the introduction of more comprehensive GDL systems is associated with reductions in fatal and serious injury crashes.\textsuperscript{20,21} Other studies in various jurisdictions demonstrate a reduction on road crashes attributable to GDL systems, however not as significantly as when it was first introduced.\textsuperscript{22,23}

Road traffic crashes are an alarming public health issue throughout the world,\textsuperscript{24} including in Oman,\textsuperscript{25} despite ongoing improvements in traffic law enforcement practices and technology. One of the main target groups for road safety in Oman are young drivers aged 17-25 years. According to the licensing system in Oman, as comprised in the Traffic Law, the minimum age to apply for licence is 18 years, with a provision for an exception in some cases where the minimum age may be 17. In a recent investigation examining the characteristics of crashes in Oman involving young drivers over a three year period, Al-Reesi, Buckley\textsuperscript{26} found that although young drivers aged 17-25 years comprise around 17\% of all licence holders, they represented more than one third of all drivers involved in road traffic crashes in Oman. Specifically, these authors reported that of the total number of road traffic crashes in Oman for the period 2009 to 2011 (N = 33,172), a total of 11,101 involved a young driver. Examination of young drivers specifically revealed that 7,727 young drivers (69.6\%) were considered to be ‘at-fault’ at the time of the crash. There is a need to consider programs such as GDL in order to improve young driver safety in Oman.

While research has confirmed, to varying degrees, the effectiveness of GDL systems,\textsuperscript{27,28,3,4,29,30,14,15} there is limited evidence available regarding the mechanisms by
which they successfully reduce crashes and which particular components are most effective.\textsuperscript{15} The available research has suggested that requiring a learners permit for a minimum of 12 months, having a passenger restriction, and a night-time restriction component were the most effective in reducing fatal crashes.\textsuperscript{31} This review is intended to provide an update on the existing literature, with special attention given to the role of parents and enforcement related issues.

\textit{The learner phase}

The learner phase is designed to allow new drivers the opportunity to gain practical driving experience with vehicle handling, the road environment and with the behaviour of other drivers while under the supervision of a more experienced driver.\textsuperscript{2} This phase recognises that individuals need to learn how to drive and to accumulate their initial driving experience in lower risk situations with an experienced supervisor.\textsuperscript{1,8} It aims to provide individuals with the experience and capabilities for when they drive by themselves.\textsuperscript{21} While the learner phase is critical in a comprehensive GDL system,\textsuperscript{32} it is important to note that supervised driving is inherently different from unaccompanied driving.\textsuperscript{2} Supervised driving is designed to effectively teach and allow the learner to develop experience as a driver.\textsuperscript{33} Benefits from the learner phase may result through delayed licensure, the supervised learning process, mandated hours of practice and the involvement of parents.

\textit{Delayed licensing}

Delayed licensing occurs when learner drivers are delayed from being able to drive without supervision for a time. It limits learners’ exposure to risky driving situations and allows them time to mature thereby reducing crashes.\textsuperscript{34} Delayed licensing can include increasing the amount of time that must be spent as a learner or raising the minimum age to obtain a learner licence.\textsuperscript{35-37}
Raising the licensing age from 16 years to 16½ years in New Jersey has been associated with a seven percent lower fatal crash rate, while delaying the licensing age to 17 years was associated with a 13 percent lower fatal crash rate. An analysis of fatal crash rates for 15, 16 and 17 year olds in the USA revealed that jurisdictions that allow individuals to learn to drive and become licensed at an earlier age have higher crash rates. Additionally, recent literature suggests that a GDL system that is inclusive of all ages reduces novice driver crash risk, however conversely, a GDL system can increase the crash risk if it is only applicable to those under 18 years.

Furthermore, the length of time that the learner licence is valid provides another method of delaying licensing. Learner licences that expire in a relatively short time period may encourage individuals to become licensed near the expiration date due to the sense of urgency that the short time frame creates. Allowing learners to drive on a licence that does not expire for a significant time period does not create this pressure.

Supervised learning

Higher order skills such as perception, attention and judgement develop over several years in comparison to basic motor skills. The amount of practice required for learning to drive is not known. Although new drivers’ ability improves over time, it does not equal the ability of more experienced drivers in more complex driving situations. Research suggests that the more supervised practice that a learner undertakes reduces their risk of crashing once they commence solo driving.

The amount of practice undertaken by learner drivers may be affected by a number of factors. This includes increasing self-confidence as vehicle control skills improve, time constraints including employment, social events, education, and holding the learner’s licence. Research has identified that learners fail to gain much experience in potentially
higher-risk situations, such as driving in the rain or at night, however they quickly became confident of their driving abilities by the time they reach the next stage of licensing.\textsuperscript{42,41} This suggests that more hours of accompanied driving undertaken results in a more positive perception of this period.\textsuperscript{43}

\textit{Mandated hours of practice}

Some jurisdictions require learners to obtain and record in a logbook a fixed number of driving hours, with research suggesting that mandating a number of hours of supervised practice increases the amount of practice undertaken.\textsuperscript{44,45} These requirements in the USA vary from 20 to 65 hours.\textsuperscript{46} Some states within Australia require learner drivers to complete significantly more practice. For instance, learner drivers in Victoria and New South Wales must complete 120 hours while those in Queensland must record 100 hours.\textsuperscript{47} However, in Queensland, learner drivers are able to record 3 hours within their log book for every hour completed with a professional driving instructor up to 10 hours of practice or 30 log book hours.\textsuperscript{33} This means that learner drivers in Queensland may be able to record 100 hours within a log book with only 80 hours of practice undertaken. There appears to be little research basis for the selection of particular time limits.\textsuperscript{48,2} although there is some research support for learners obtaining close to 120 hours of practice, suggesting that supervised learning reduced crash rates once the individual commenced driving on their own.\textsuperscript{49} Additionally, jurisdictions with 50 or more mandated hours of practice have higher levels of parental involvement than those with less or no mandated hours.\textsuperscript{50}

However, the mandated number of hours may imply to learners and their parents that this is all the time it takes to learn the required driving skills and that it is a simple task that is completed as soon as the learner requirements are fulfilled.\textsuperscript{2} Requiring new drivers to
complete a certain amount of practice may also delay licensing and thus reduce their exposure to the risk of crashing.\textsuperscript{34}

There are also a number of potential drawbacks involving parents in ensuring that learner drivers obtain sufficient supervised practice.\textsuperscript{51} This includes that the supervised practice may lack variety and parents may undertake many of the higher order driving tasks on behalf of the learner, thereby preventing the development of skills in identifying hazards and managing distractions. This concept is supported by the findings of research undertaken in North Carolina which identified that parents of teenage learner drivers focussed on teaching vehicle handling skills rather than higher-order perceptual and cognitive skills.\textsuperscript{52}

Other potential drawbacks include little parental knowledge of the mandated number of hours and parental perceptions of supervised practice.\textsuperscript{53} Research indicates that parents find the log book system is not an effective measure of the amount of driving practice despite reporting that their own child’s log book is accurate.\textsuperscript{54} However, the use of a log book to record hours may help structure learners’ driving practice, allowing other supervisors to know how much the learner had practiced.\textsuperscript{55}

Research suggests that log books are not completed in voluntary systems.\textsuperscript{44,55} Before completing a learner log book was a compulsory requirement within the Queensland GDL system, two-thirds of participants within a study indicated that they were unaware that a voluntary log book was available for completion.\textsuperscript{42}

\textit{The provisional phase}

An important component of effective GDL systems is the limiting of driving in high risk situations for the first few months or years after the new driver receives their licence.\textsuperscript{38} The provisional phase is designed to reduce new drivers’ exposure to risky situations when they first commence driving without supervision by limiting their driving in certain riskier situations such as at night, with passengers, or after drinking alcohol.\textsuperscript{9}
Night driving restrictions

Younger drivers are far more likely than older drivers to crash at night.\textsuperscript{38} Night driving restrictions have been introduced in several jurisdictions including New Zealand as well as numerous states in the USA.\textsuperscript{6} Restricting late night driving for young drivers is shown to be effective in reducing crashes and young driver fatalities.\textsuperscript{56,4} A national study within the United States of America suggested that the night time fatal crashes for 16 and 17 year old drivers was reduced by approximately 10 per cent when compared with older peers.\textsuperscript{57} The effectiveness of the night time driving restriction however, is affected by the time it starts, the role of parents, and the availability of exemptions.\textsuperscript{37} Night time restrictions have shown to be more effective when they restrict driving before midnight, and even with a 50 percent compliance rate, are still effective in reducing crashes.\textsuperscript{58,59}

Passenger restrictions

Drivers tend to exhibit safe driving behaviours such as wearing a seatbelt when they are accompanied by passengers. The greater the number of passengers, the greater the likelihood that safe driving behaviours will be displayed by the driver.\textsuperscript{60} Conversely, younger drivers accompanied by younger passengers are more likely to cause a crash than any other age group.\textsuperscript{61,60,38} The more young passengers present, the greater the crash risk both at night and during the day.\textsuperscript{37} With a passenger restriction, while passengers under a certain age are prohibited, family members are generally exempted from the restriction and are able to drive with the provisional licence holder at all times.\textsuperscript{37}

Research from New Zealand suggests there is a reduction in provisional licensed driver crashes when a passenger restriction is in place.\textsuperscript{18} Evaluations conducted in the USA have also found positive effects relating to the implementation of the passenger
Research from the United States of America suggests that GDL laws with no teen passengers permitted are effective in reducing fatal crashes for 16 and 17 year old drivers with teen passengers. Research from the United States of America suggests that any peer passenger restriction, whether it allows no, one or two peer passengers, is effective in reducing fatal crashes for 16 and 17 year old drivers. Provisional drivers are less likely to comply with the passenger restriction than they are with a night driving restriction. However, one study calculated that even with a 50 percent compliance rate fatalities and serious injuries to novice drivers reduced.

**Blood Alcohol Content restrictions**

Young people drink and drive less frequently than adults but when they do drink and drive, they have an increased risk. While Blood Alcohol Content (BAC) restrictions for all drivers are frequently present in licensing systems, restricting BAC at a much lower level is often part of a GDL system. All Australian states have BAC restrictions for provisional drivers, although this restriction may sometimes only apply to drivers below a certain age. Additionally, New Zealand and jurisdictions within the USA and Canada also have BAC restrictions. Research suggests that there is strong evidence that restricted BAC laws for younger drivers are effective in reducing crash risk for new drivers.

**Mobile phone restrictions**

Younger drivers are more likely than older drivers to use their mobile phone while driving. One survey study of American college students found that they were more likely to crash or nearly crash while talking on a mobile phone rather than when dialling or answering their mobile phone. The introduction of mobile phone bans is designed to counter the problem of distraction for new drivers. Research suggests that drivers that use
mobile phones (including texting) while driving may have an increased risk of crashing.\textsuperscript{68,69} The incorporation of a mobile phone ban into GDL systems has also been prompted by research indicating that the use of hands-free mobile phone devices does not eliminate the crash risk.\textsuperscript{70}

Restrictions on mobile phone use are present in several USA and Australian jurisdictions. These restrictions can be either for all drivers or just for newly licensed drivers.\textsuperscript{47,37} Foss, Goodwin \textsuperscript{71} examined mobile phone use and identified that the law had little effect on the use of these devices by young drivers. The method of enforcement of this restriction is likely to impact on its effectiveness.\textsuperscript{72,71} Public education campaigns that are implemented in an evidence-based manner may be useful in reducing illegal mobile phone use.\textsuperscript{73,74}

\textit{Vehicle power restrictions}

A vehicle power restriction is used to limit the type of car that a newly licensed driver may drive.\textsuperscript{75} For instance, they may be restricted to a certain number of cylinders or a power-to-weight ratio. The rationale for this restriction is that young drivers who have an above average performance vehicle tend to have a more dangerous attitude to driving than other young drivers.\textsuperscript{76} Vehicle power restrictions have existed for some time in Australia,\textsuperscript{75} however the effectiveness of this restriction in reducing crashes is at best limited. A recent study suggests that, due to the low numbers of high powered vehicles driven by provisional drivers, the reduction in injury rates from these restrictions ranges from .4 percent in New Zealand to 2.5 percent in the Australian states of Queensland and Victoria, provided there was 100 percent compliance with this restriction.\textsuperscript{75}

\textit{P-plates}
P-plates, also known as decals, are used to indicate to others that the driver of the vehicle holds a provisional licence and is therefore not yet fully licensed.\textsuperscript{77} The mandatory display of P-plates may increase compliance with,\textsuperscript{78} and enforcement of, other restrictions.\textsuperscript{4,79} They may also indicate to other drivers that the person holds a provisional licence and encourage the driver to limit their risk taking behaviours.\textsuperscript{80} Additionally, the removal of the requirement to display these plates could be seen as an incentive for provisional drivers.\textsuperscript{80}

One study evaluated the decal law in New Jersey and found it positively affected provisional drivers’ safety and reduced their crash rate by nine percent.\textsuperscript{77} The requirement to display decals is not popular with young people in New Jersey.\textsuperscript{81} Focus groups with young drivers in Queensland indicated that they felt that police may target them for enforcement when they are required to display P-plates.\textsuperscript{82}

Exit tests

The purpose of an exit test is to test a provisional driver before they obtain their full driving licence. It is designed to ensure that the provisional driver is capable of holding a full (unrestricted) licence\textsuperscript{83} and may highlight the fact that a provisional driver is still developing their driving skills and abilities.\textsuperscript{6} Exit tests, like other tests within the licensing system, can use a range of formats including knowledge tests, hazard perception tests or on-road driving tests.\textsuperscript{63} One North American study identified that an exit test is beneficial as it reduces relative fatality risk,\textsuperscript{30} although another review concluded that the effectiveness of driver testing, including exit tests, is not known.\textsuperscript{64}

Parental involvement

A key factor within GDL systems is the level of support that parents provide\textsuperscript{4,8} with parental involvement impacting positively on the safety of young drivers.\textsuperscript{85} Parents involved
in the learning process tend to be strong supporters of GDL,\textsuperscript{86,4,87-89} however, while GDL systems that implicitly encourage parental involvement are now implemented in many jurisdictions, parents tend not to be systematically involved in the process.\textsuperscript{34} A criticism of many studies is that they look at novice drivers in isolation, rather than the relationship between novice drivers, their peers and their parents in a holistic way.\textsuperscript{90}

\textit{Parental involvement in the learner phase}

The involvement of parents in the learner phase is critical to the success of GDL systems.\textsuperscript{4} The support of parents is necessary in order for the majority of learner drivers to accrue sufficient driving experience\textsuperscript{41} with learners indicating that the cost of accessing professional driving instructors as an alternative was prohibitively expensive.\textsuperscript{91} Young drivers in GDL programs have increased parental driving instruction and supervised driving during the learner phase\textsuperscript{92} with parents tending to take more time to supervise their learners driving than required by law.\textsuperscript{45} Research suggests that, at least for the first four months of supervised driving, parents tend to focus on vehicle handling and operation.\textsuperscript{93}

It appears that mothers take responsibility for much of the supervision of learner drivers. A study in North Carolina identified that mothers assumed most of the responsibility for supervising the teenage driver when they were driving on a learner licence.\textsuperscript{52} Research suggests that mothers appeared to be more safety conscious than fathers, and consider driving at all stages of licensure riskier.\textsuperscript{94,88,89} Perhaps this explains why mothers are more likely to delay driving privileges than fathers.\textsuperscript{88} Parents will continue to influence the newly licensed driver’s behaviour once they progress to solo driving.\textsuperscript{90,95,96,2}

\textit{Parental involvement in the provisional phase}
Parental involvement does not cease once the new driver obtains their provisional licence. Some authors argue that parental involvement is most important when young drivers are able to drive solo.\textsuperscript{51} Parents can be involved by playing an active role in placing restrictions on new drivers by enforcing the GDL requirements.\textsuperscript{92} However, parents and their children may not agree on driving rules with parents tending to have stricter interpretations.\textsuperscript{97,98} For these reasons, parents may not become actively involved in managing their children’s driving.\textsuperscript{98}

While nearly all parents place driving restrictions on their children, young drivers who have been licensed under a GDL system report more restrictions on their driving by parents.\textsuperscript{99,92} Research indicates that most parents set limits on newly licensed drivers, although these limits tend not to be strict or maintained too long.\textsuperscript{100} The restrictions may also be focussed on issues, such as obtaining permission to drive the car, that may not directly affect crash risk.\textsuperscript{51}

Young drivers with parents who have imposed stricter limits reported engaging in less risky driving behaviour and had fewer traffic violations and crashes.\textsuperscript{101,51,102} While parental limit setting does have some safety benefits, it appears that these benefits are modest, have a limited time span and are not well enforced with clear consequences.\textsuperscript{51}

\textit{Programs targeting parents}

Programs that aim to develop parents’ skills and abilities to manage their child’s progress through the GDL system are being developed. Given that siblings, parents, and other family members reported that parental involvement in supervising learner driving should be extensive, the need to increase parent education is important.\textsuperscript{103} Whilst many educational programs are adopted for parents,\textsuperscript{104} the most common parent educational program is the Checkpoints Program used in the USA which is designed to encourage parents to limit
driving under high risk conditions when their child is first licensed.\textsuperscript{4} The Checkpoints Program uses videos, newsletters and a parent-teen driving agreement in order to encourage parent monitoring of their child’s driving. Evaluations of this program identified that it was effective in parental limit setting and on teenage risky driving behaviour and traffic offences during the first 12 months of driving.\textsuperscript{51}

Connecticut now requires a parent to complete training course at the commencement of their child learning to drive. Research suggests that parents approve of the requirement to attend the course and believe the training would help them in their role as supervisor of a learner driver. Some parents stated that they were more likely to enforce the GDL rules as a result of this course.\textsuperscript{105}

\textit{Compliance and enforcement}

\textit{Compliance}

New drivers do not uniformly comply with all restrictions present in GDL systems with the levels of compliance higher for some restrictions when compared with others. As an example, new drivers are more likely to comply with a late night driving restriction than with the peer passenger restriction.\textsuperscript{106} It appears that as novice drivers progress through their provisional driving licence, they become less compliant with road laws.\textsuperscript{107}

In North Carolina, 17 percent of learner drivers drove without a supervisor.\textsuperscript{108} In Nova Scotia and California, approximately 40 percent of intermediate licensed drivers had occasionally violated the night driving restriction. However, only 12 to 15 percent of drivers on their intermediate licence violated the night driving restriction often.\textsuperscript{109,110} Despite the fact that significant numbers of new drivers have, at some stage, not complied with a GDL restriction, the laws are still successful in reducing crash risk for novice drivers.\textsuperscript{63} Nevertheless, the effectiveness of GDL systems will probably be enhanced by improving
compliance with the restrictions. Accordingly, it is important to examine the factors that influence compliance rates.

Compliance with the GDL system is, to some extent, self-motivated. Individuals are expected to conform to the laws as they represent the standard of behaviour. However, this will not work if the GDL laws require new drivers to comply with standards that are not considered ‘reasonable’ by the majority of new drivers. Compliance with the GDL system can therefore be enhanced by ensuring that most new drivers consider the provisions contained within the GDL system are reasonable.\textsuperscript{111}

It appears as if parents also impact on the likelihood that their children will comply with the road laws. Those novice drivers whose parents provide a strong supervision role display a more negative attitude towards violating road rules. They also have less intention of violating these laws.\textsuperscript{112}

\textit{Enforcement of road laws}

Generally speaking, the enforcement of traffic laws is the most common initiative used to modify driver behaviour and thus reduce the incidences of crashes.\textsuperscript{113} However, the provisions of a GDL system are difficult for police officers to enforce, particularly if they are unable to recognise which driving restrictions apply to which licence.\textsuperscript{90,106} If police officers do not have a full understanding of the GDL laws they may be placed in a difficult situation when they attempt to enforce laws on new drivers who have a greater knowledge of the laws.\textsuperscript{114}

One study examined if publicity and increased enforcement increased compliance with GDL restrictions. The program used mechanisms known to change driver behaviour in other contexts. It resulted in a modest increase in infringement notices issued to novice drivers, although virtually no tickets had been issued previously.\textsuperscript{114}
GDL relies on parents to enforce the various provisions.\textsuperscript{105,1,88,111} Given the difficulties involved with police enforcement, parents are implicitly expected to implement driving restrictions and monitor compliance with these restrictions.\textsuperscript{115} Research has shown that parents play a significant influence on the driving compliance of provisionally licensed drivers, more than police.\textsuperscript{90} GDL programs provide parents with support in setting limits for their children. GDL systems clearly identify the factors that are high-risk and establish clear limits for parents on what is appropriate driving behaviour.\textsuperscript{99} Effective enforcement of GDL provisions by parents requires them to be aware of the requirements of the GDL system in their jurisdiction.\textsuperscript{105}

**Summary**

GDL aims to gradually increase the exposure of new drivers to more complex driving situations in as safe a manner as possible. GDL systems typically consist of learner, provisional and open licence phases. The first phase of a GDL system, the learner licence, is designed to allow new drivers to obtain practical driving experience in a lower risk situation. Benefits from this phase may result from delayed licensure, the supervised learning process, mandated hours of practice and the involvement of parents. The second phase of the GDL system, the provisional licence, reduces new drivers’ exposure to risky driving in situations such as at night, with passengers or after drinking alcohol. It manages this risk by putting various driving restrictions in place. The involvement of parents with GDL appears essential. They tend to have a heavy involvement in helping their learner obtain sufficient practice and enforcing compliance with restrictions once the new driver obtains a provisional licence.

Given the significant number of young drivers involved in crashes within Oman, GDL is one countermeasure that may be beneficial in reducing crash risk and involvement for this group.
Oman has an opportunity to apply the international research reviewed above and introduce various aspects of GDL that have demonstrated crash reductions in other jurisdictions.
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