

Cellphones, texting and driving

By **Matthew J. DeGaetano, DC and Steve Baek, DC**
Certified in Personal Injury



FILE - In this Aug. 5, 2010 file photo, a rescue worker is seen at the scene of an accident involving two school buses, a tractor-trailer and another passenger vehicle, near Gray Summit, Mo. Federal safety investigators say a 19-year-old driver was texting at the time his pickup truck, two school buses and other vehicles collided in a deadly pileup on an interstate highway in Missouri last year. The National Transportation Safety Board (NTSB) released the information Monday.(AP Photo/Jeff Roberson, File)

August 2014

How many people use cellphones to talk or text?

Cellphone use in the United States has grown quickly during the past decade. There were about 326 million wireless cellphone subscribers as of December 2012. ¹ That's more than double the number of subscribers in December 2002. Texting is growing more rapidly than talking on cellphones. The annual number of minutes spent talking on cellphones increased 8 percent from 2007 to 2012, while the annual number of text messages sent or received increased by more than 500 percent. In 2012, people talked on cellphones for 2.3 trillion minutes and sent and received 2.2 trillion text messages.

How frequently do drivers talk on the phone or text behind the wheel?

A 2012 national observational survey found that 5 percent of drivers stopped at intersections were talking on hand-held phones at any moment during the day. ² Combining this observational

data with self-reported data on hand-held and hands-free phone use, the government estimates that 9 percent of drivers were having phone conversations during any moment of the day. This rate has held steady in recent years after nearly doubling between 2000 and 2005.

In a 2009 national telephone survey conducted by the Institute, drivers on average reported spending roughly 7 percent of time behind the wheel talking on phones. ³ Two “naturalistic” studies that continuously monitored and videotaped drivers estimated cellphone use during every day driving. In one study conducted in Michigan from 2009-10 drivers talked on cellphones about 7 percent of the time, on average. ⁴ The other study, conducted in Virginia and North Carolina during 2011, focused on drivers who reported using a phone daily while driving. These drivers were observed talking on cellphones 11 percent of the time. ⁵

Less is known about the frequency of texting behind the wheel. In a 2013 national survey of drivers age 16 years and older, about one-quarter of drivers reported sending a text message or e-mail while driving at least once in the past 30 days, and about three-quarters said they had read a text or e-mail. ⁶ National observation surveys indicate the rate of drivers texting and driving at any moment during the day is low but may be rising. In 2012, 1.5 percent of drivers were observed texting or otherwise manipulating hand-held devices. ² That’s a 150 percent increase from 0.6 percent in 2009.

Who is most likely to use a cellphone while driving?

Younger drivers are more likely than older drivers to talk on phones and to text while driving. In a 2013 national survey, about 72 percent of drivers 19-24 years old and 82 percent of drivers 25-39 years old said they had talked on a cellphone while driving at least once in the past 30 days, but only 51 percent of drivers 60-74 years old and 31 percent of drivers 75 and older said the same. A larger proportion of 19-24- and 25-39-year-old drivers also said they had read or sent a text or e-mail while driving at least once in the past 30 days compared with the proportion of drivers 60 and older who said they did. ⁶ In 2012, nearly 6 percent of drivers ages 16-24 observed in the daytime while stopped at intersections were talking on a hand-held cellphone, compared with 5 percent of drivers ages 25-69. In the same survey, about 3 percent of drivers 16-24 were observed manipulating a hand-held device, while only a little more than 1 percent of drivers 25-69 were observed doing the same. ² A recent study looked at phone use of adult drivers and newly licensed teenage drivers in random samples of video recordings during everyday driving. Teenagers were talking or listening to a hand-held or hands-free cellphone in 5 percent of the clips compared with 6 percent of adults. Both teenagers and adults dialed or reached for their phones in less than 1 percent of the clips. ⁷

There is evidence that people who use cellphones more frequently while driving than other people also engage in other risky driving behaviors more frequently. In an on-road study, drivers who reported frequent cellphone use drove faster, changed lanes more often and made more hard braking maneuvers than drivers who said they rarely used cellphones while driving. ⁸ In a national survey of high school students of driving age, those who said they had sent or received at least one text message or email while driving in the past 30 days were more likely than other

students to report not always using a safety belt as a passenger, riding with a driver who had been drinking, and driving after drinking. 9

How does talking on a cellphone or texting while driving affect crash risk?

Two epidemiological studies have linked talking on a cellphone directly to increased crash risk, using cellphone billing records to verify phone use of crash-involved drivers. A 2005 Institute study of drivers in Western Australia found that when drivers were talking on mobile phones there was a fourfold increased likelihood of a crash resulting in injury to the driver. 10 The findings were consistent with 1997 research that showed phone use among Canadian drivers was associated with a fourfold increase in the risk of a crash involving property damage but no injury. 11

The effects of handheld cellphone use on safety-critical events, such as crashes, near-crashes, traffic conflicts and lane drifts, have been examined in naturalistic studies that continuously videotape drivers and monitor their driving. In these studies, the odds of a safety-critical event were significantly higher when drivers were dialing a cellphone, placing a call, or texting, but not when drivers were talking or listening. 5, 7, 12 These studies provide precise information about what drivers are doing. However, crashes are very rare, and the crashes that do occur are mostly minor. It is unknown how well less severe events like traffic conflicts and near-crashes predict actual crash risk, especially the risk of more serious crashes.

How many crashes have been caused by drivers using cellphones?

Based on national data on fatal crashes in the United States, 3,328 people died in crashes in 2012 in which the police reported that distraction was a contributing factor. 2 Cellphone use was indicated as a contributing factor in 12 percent of these deaths. However, these statistics are imprecise and likely underestimate the role of distraction in fatal crashes. Police crash reports aren't a reliable way to count cellphone-related collisions because drivers often don't volunteer that they were on the phone and there is usually a lack of other evidence to determine the driver's phone use. Plus, the codes for reporting distractions on police crash reports vary from state to state.

In an in-depth study of a nationally representative sample of police-reported crashes occurring during 2005-07 and involving at least one vehicle towed from the scene, crash-involved drivers and witnesses were interviewed at the crash scene to examine the role of driver inattention and other pre-crash factors. Based on these interviews, police reports, and other information, cellphone use (talking, dialing, hanging up or text messaging), was estimated to be a factor in about 3 percent of the crashes. 13 Although this study attempted to identify pre-crash events, it still is likely that the estimates of distraction are imprecise as they rely heavily on the self-report of drivers and observers.

Estimates of the crash risk associated with cellphone use have been combined with the estimated prevalence of drivers' phone use to project the expected number of crashes linked to phone use. An Institute study following this approach indicated that drivers' phone use could account for 22 percent of all police-reported crashes, based on an estimated fourfold increase in crash risk

associated with phone use and survey results indicating that drivers use phones 7 percent of the time. 3

However, there is a disconnect between these results and real-world crash trends, which show declines in recent years. There were about 5.6 million police-reported crashes in 2012, considerably fewer than the 6.4 million crashes in 2000, when national observation surveys began documenting the increase in drivers' phone use. An increase in crashes isn't showing up in insurance claims either. An analysis by HLDI indicates that the rates of insurance collision claims have declined from 2000-2012. 14

Is cellphone use the biggest source of distraction in crashes?

It's impossible to gauge the precise contribution of various types of distractions to crashes. Driver distraction was present in crashes long before cellphones came along, but the fact that a driver was distracted around the time of a crash doesn't mean the distraction contributed to the crash. An in-depth study of crashes published in the late 1970s indicated that more than 90 percent of crashes were attributable to driver-related factors; driver inattention was present in 15 percent of the crashes and distraction from something in the vehicle was present in 9 percent. 15 More recent research used police crash reports, interviews of witnesses and crash-involved drivers, and other information to study pre-crash factors in crashes occurring in 2005-07. 16 Driver-related factors contributed to 93 percent of crashes. Conversing with a passenger was the most common in-vehicle distraction and was present in (and may or may not have contributed to) about 16 percent of crashes. Cellphone use was present in about 3 percent of crashes. 13

How do cellphone use and texting affect driving performance?

The effect of cellphone use on driving performance has been extensively researched. Based on an Institute review of cellphone and driving research, nearly all experimental studies using driving simulators or instrumented vehicles reported that some measures of driver performance were affected by the cognitive distractions associated with cellphone tasks. 17 Statistical analyses that aggregated the results of 33 studies in one analysis and 23 studies in another reported significant delays in drivers' reaction time but small or no effect of cellphone conversations on lane keeping, speed, or following distance. 18, 19

Fewer experimental studies have examined texting and driving. Three simulator-based studies found that receiving and sending text messages slowed young drivers' reaction times and degraded lane-keeping ability. 20, 21, 22 Based on a recent review of 14 experimental studies using driving simulators or instrumented vehicles, most studies reported sending or receiving text messages significantly slowed reaction time, increased lane deviations, and increased the length of time drivers looked away from the roadway. 23

Cellphone use also affects how drivers scan and process information from the roadway. Drivers generally take their eyes off the roadway to dial or manipulate a hand-held phone. In contrast, drivers engaged in cellphone conversations and other forms of cognitive distraction tend to concentrate their gaze toward the center of the roadway, 24, 25, 26 but their attention still may be diverted from driving and interfere with processing what they see. 27 Using brain imaging

techniques, researchers found a 37 percent reduction in brain activity associated with driving when subjects performed a task via a headset while steering a simulated vehicle. ²⁸ Other researchers have found similar suppression of brain activity associated with visual processing and attention when drivers are cognitively distracted. ^{29, 30} Consequently, cognitive distractions can lead to so-called “inattention blindness” in which drivers fail to comprehend or process information from objects in the roadway even when they are looking at them. ²⁷

Are hands-free cellphones safer than hand-held cellphones?

The relative safety of hands-free and hand-held cellphones is unknown. Hands-free phones may eliminate some of the physical and visual distraction of handling phones or dialing, but the cognitive distraction associated with conversation remains. Two studies of crashes using cellphone billing records to verify phone use found about a fourfold increase in crash risk when conversing on either hands-free or hand-held phones. ^{10, 11} The studies were unable to estimate crash risk from different types of hands-free devices. They also were unable to determine whether there was any benefit associated with hands-free devices while placing the call. Experimental research using driving simulators indicates that phone conversation tasks, whether using hand-held or hands-free devices, affect some measures of driving performance. ^{17, 18, 19}

How common are laws limiting drivers’ use of cellphones?

Bans on hand-held phone conversations while driving are widespread in other countries and are becoming more common in the U.S. In 2001, New York became the first state to ban hand-held phone conversations by all drivers. Now, 14 states and the District of Columbia have similar laws.

In 2002, New Jersey became the first state to limit young drivers’ use of any kind of cellphone. Now 37 states and the District of Columbia have similar restrictions. The District of Columbia in 2004 and Connecticut in 2005 prohibited texting while driving as part of a law broadly addressing driver distraction. In January 2008, Washington became the first state to prohibit texting specifically by all drivers. Now texting is banned for all drivers in 44 states and the District of Columbia, and an additional four states (Mississippi, Missouri, Oklahoma and Texas) prohibit texting only for novice drivers.

Cellphone laws in the U.S.

Do drivers comply with bans on hand-held phone use and texting?

Institute research has documented that all-driver bans on hand-held phone conversations can have large and lasting effects on phone use. Based on observations of drivers conducted up to seven years after bans were implemented in New York, the District of Columbia and Connecticut, the rates of driver hand-held cellphone conversations were an estimated 24-76 percent lower than would have been expected without a ban. ³¹ In the Institute's 2009 telephone survey about cellphone use, 56 percent of drivers in states with bans reported they use phones when driving, compared with 69 percent in states without such laws. ³² The proportion of drivers

who talk on phones and always talk hands-free was 22 percent in states with all-driver bans on hand-held phones and 13 percent in states without all-driver bans.

Phone bans seem to have less effect on younger drivers. Since Dec. 1, 2006, North Carolina has banned the use of any telecommunications device by drivers younger than 18. Eleven percent of teenagers leaving high schools in the afternoon were using phones prior to the ban, and this did not change significantly when measured five months after the restriction took effect or two years later. ^{33,34}

There is scant information on drivers' compliance with texting bans. The Institute's 2009 survey of drivers found that among 18-24 year-olds 45 percent reported texting while driving in states that bar the practice, just shy of the 48 percent of drivers who reported texting in states without bans. ³² Among drivers ages 25-29, 40 percent reported texting in states with bans, compared with 55 percent in states without bans.

High-visibility enforcement campaigns may be one way to increase compliance with cellphone and texting bans. After programs of publicized, high-intensity enforcement of hand-held cellphone and texting bans were implemented, the number of drivers observed holding a phone to their ear declined by 57 percent in Hartford, Conn., and did not decline in a comparison community. Observed hand-held phone conversations went down 32 percent in Syracuse, N.Y., but also declined 40 percent in a comparison community; both changes were significant. Observed manipulation of hand-held phones (e.g., dialing, texting) decreased significantly in both cities following the enforcement initiative and did not decrease in the comparison communities. ³⁵

Do bans on hand-held phone use and texting reduce crashes?

Despite any effects on phone use and texting, there is little evidence so far that banning hand-held phone use or texting reduces crashes. A 2009 analysis found that hand-held bans had no effect on insurance collision claim rates. ³⁶ Researchers compared rates of claims for crash damage in three states and the District of Columbia before and after hand-held phone use bans went into effect and found no significant change in claim rates for two jurisdictions relative to comparison states and small, but significant, increases in claim rates in the other two.

A 2010 study examined rates of insurance claims filed for damage to vehicles before and after driver texting bans were enacted in four states. ³⁷ There was no significant change in one state relative to comparison states and significant increases of 7-9 percent in three states. Increases in claim rates also were found for drivers 25 and younger in these three states.

Can technology be used to reduce crash risks related to distracted driving?

Crash avoidance technology may be the most promising avenue for reducing crash risks related to distractions of any type. This technology can use warnings to redirect a distracted, inattentive, or sleepy driver's attention back to the roadway if it detects the potential for a collision. Some systems attempt to avoid the collision altogether if a driver does not respond fast enough or does not respond at all.

More information on crash avoidance technology

Automakers are integrating "infotainment" systems into vehicles to let drivers and other occupants plug in or wirelessly connect portable electronic devices such as cellphones or MP3 players to vehicle entertainment and communication systems. Some systems allow drivers to interact with portable devices and other vehicle systems using voice commands. Several experimental studies have shown that drivers take shorter glances away from the roadway and keep their eyes on the road for a greater proportion of the time when interacting with a portable device connected to the vehicle using voice commands than they do when using their hands. 38, 39, 40 However, using voice commands can be cognitively distracting and can add more steps to a task since voice commands often need to be verified. 41, 42 The effects of voice-activated integrated systems on crash risk are unknown. NHTSA has issued voluntary guidelines for integrated infotainment systems in an effort to minimize the visual and manual distraction potential of these systems. 43

Phone applications that restrict or limit access to electronic devices also have been developed. These apps generally work when vehicles are in motion and can silence the phone, redirect incoming calls to voicemail or respond to text messages with a preprogrammed message. At this point, it is unclear to what extent these apps are used and to what extent they affect drivers' behavior or crash risk.

References

- 1 CTIA – The Wireless Association. 2012. CTIA's semi-annual wireless industry survey results, June 1985-June 2012. Washington, DC. Available: http://files.ctia.org/pdf/CTIA_Survey_MY_2012_Graphics-_final.pdf. Accessed: March 13, 2014.
- 2 National Highway Traffic Safety Administration. 2014. Driver electronic device use in 2012. Report no. DOT HS-811-884. Washington, DC: U.S. Department of Transportation.
- 3 Farmer, C.M.; Braitman, K.A.; and Lund, A.K. 2010. Cellphone use while driving and attributable crash risk. *Traffic Injury Prevention* 11(5):466-70.
- 4 Funkhouser, D. and Sayer, J. 2012. Naturalistic census of cell phone use. *Transportation Research Record* 2321:1-6.
- 5 Fitch, G.A.; Soccolich, S.A.; Guo, F.; McClafferty, J.; Fang, Y.; Olson, R.L.; Perez, M.A.; Hanowski, R.J.; Hankey, J.M.; and Dingus, T.A. 2013. The impact of hand-held and hands-free cell phone use on driving performance and safety-critical event risk. Report no. DOT HS 811-757. Washington, DC: National Highway Traffic Safety Administration.
- 6 Hamilton, B.C.; Arnold, L.S.; and Tefft, B.C. 2013. Distracted driving and perceptions of hands-free technologies: finding from the 2013 traffic safety culture index. Washington, DC: AAA Foundation for Traffic Safety.
- 7 Klauer, S.G.; Guo, F.; Simons-Morton, B.G.; Ouimet, M.C.; Lee, S.E.; and Dingus, T.A. 2014. Distracted driving and risk of road crashes among novice and experienced drivers. *New England Journal of Medicine* 370:54-9.

- 8 Zhao, N.; Reimer, B.; Mehler, B.; D'Ambrosio, L. A.; and Coughlin, J. A. 2012. Self-reported and observed risky driving behaviors among frequent and infrequent cell phone users. *Accident Analysis and Prevention* - epub ahead of print.
- 9 Olsen, E.O.; Shults, R.A.; and Easton, D.K. 2013. Texting while driving and other risky motor vehicle behaviors among U.S. high school students. *Pediatrics* 131(6):e1708-15.
- 10 McEvoy, S.P.; Stevenson, M.R.; McCartt, A.T.; Woodward, M.; Haworth, C.; Palamara, P.; and Cercarelli, R. 2005. Role of mobile phones in motor vehicle crashes resulting in hospital attendance: a case-crossover study. *British Medical Journal* 331(7514):428-30.
- 11 Redelmeier, D.A. and Tibshirani, R.J. 1997. Association between cellular-telephone calls and motor vehicle collisions. *The New England Journal of Medicine* 336:453-58.
- 12 Olson, R.L.; Hanowski, R.J.; Hickman, J.S.; and Bocanegra, J. 2009. Driver distraction in commercial vehicle operations. Report No. FMCSA-RRR-09-242. Washington, DC: Federal Motor Carrier Safety Administration.
- 13 Singh, S. 2010. Distracted driving and driver, roadway, and environmental factors. Report no. DOT HS 811-380. Washington, DC: National Highway Traffic Safety Administration.
- 14 Highway Loss Data Institute. 2013. [Unpublished analysis of collision claim frequencies]. Arlington, VA.
- 15 Treat, J.R.; Tumbas, N.S.; McDonald, S.T.; Shinar, D.; Hume, R.D.; Mayer, R.E.; Stansifer, R.L.; and Castellan, N.J. 1979. Tri-level study of the causes of traffic accidents. Report no. DOT HS 805-099. Washington, DC: National Highway Traffic Safety Administration.
- 16 National Highway Traffic Safety Administration. 2008. National motor vehicle crash causation survey: report to congress. Report no. DOT HS-811-059. Washington, DC: U.S. Department of Transportation.
- 17 McCartt, A.T.; Hellinga, L.A.; and Braitman, K.A. 2006. Cell phones and driving: review of research. *Traffic Injury Prevention* 7(2):89-106.
- 18 Caird, J.K.; Willness, C.R.; Steel, P.; and Scialfa, C. 2008. A meta-analysis of the effects of cell phones on driver performance. *Accident Analysis and Prevention* 40(4):1282-93.
- 19 Horrey, W.J. and Wickens, C.D. 2006. Examining the impact of cell phone conversations on driving using meta-analytic techniques. *Human Factors* 48(1):196-205.
- 20 Hosking, S.; Young, K.; and Regan, M. 2006. The effects of text messaging on young novice driver performance. Monash University Accident Research Center. Report no. 246. Melbourne, Victoria: Monash University.
- 21 Reed, N. and Robbins, R. 2008. The effect of text messaging on driver behavior: a simulator study. Published report PPR 367. Berkshire, United Kingdom: Transport Research Laboratory.
- 22 Drews, F.A.; Yazdani, H.; Godfrey, C.N.; Cooper, J.M.; and Strayer, D.L. 2009. Text messaging during simulated driving. *Human Factors* 51(5):762-70.
- 23 Caird, J.K.; Johnston, K.; Willness, C.; and Asbridge, M. 2013. Synthesis of text messaging and driving performance. *Proceedings of the Seventh International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design*, 348-58. Iowa City, IA: University of Iowa Public Policy Center.
- 24 Recarte, M.A. and Nunes, L.M. 2000. Effects of verbal and spatial-imagery tasks on eye fixations while driving. *J. Exp. Psychol. Appl.* 6(1):31-43.
- 25 Recarte, M.A. and Nunes, L.M. 2003. Mental workload while driving: effects on visual search, discrimination, and decision making. *J. Exp. Psychol. Appl.* 9(2):119-37.

- 26 Reimer, B.; Mehler, B.; Wang, Y.; and Coughlin, J. F. 2012. A field study on the impact of variations in short-term memory demands on drivers' visual attention and driving performance across three age groups. *Human Factors* 54(3):454-68.
- 27 Strayer, D.L.; Drews, F.A.; and Johnston, W.A. 2003. Cell phone-induced failures of visual attention during simulated driving. *Journal of Experimental Psychology Applied* 9(1):23-32.
- 28 Just, M.A.; Keller, T.A.; and Cynkar, J. 2008. A decrease in brain activation with driving when listening to someone speak. *Brain Research* 1205(2008):70-80.
- 29 Bowyer, S.M.; Hsieh L.; Moran, J.E.; Young, R.A.; Manoharan, A.; Liao, C.J.; Yu, Y.; Chiang, Y.; and Tepley, N. 2009. Conversation effects on neural mechanisms underlying reaction time to visual vents while viewing a driving scene using MEG. *Brain Research* 1251(28):151-61.
- 30 Strayer, D.L.; Martinez, M.; Cooper, J.M.; and Drews, F.A. 2006. Brain waves suppressed by cell phone conversations. *Proceedings of the human Factors and Ergonomics Society 50th Annual Meeting*, 2364-7. Santa Monica, CA: Human Factors and Ergonomics Society
- 31 McCartt, A.T.; Hellinga, L.A.; Strouse, L.M.; and Farmer, C.M. 2010. Long-term effects of handheld cell phone laws on driver handheld cell phone use. *Traffic Injury Prevention* 11(2):133-41.
- 32 Braitman, K.A. and McCartt, A.T. 2010. National reported patterns of driver cellphone use. *Traffic Injury Prevention* 11(6):543-8.
- 33 Foss, R.D.; Goodwin, A.H.; McCartt, A.T.; and Hellinga, L.A. 2009. Short-term effects of a teenager driver cell phone restriction. *Accident Analysis and Prevention* 41(3):419-24.
- 34 Goodwin, A. H.; O'Brien, N.; and Foss, R.D. 2012. Effect of North Carolina's restriction on teenage driver cell phone use two years after implementation. *Accident Analysis and Prevention* 48:363-67.
- 35 Cosgrove, L.; Chaudhary, N.; and Reagan, I. 2011. Four high-visibility enforcement demonstration waves in Connecticut and New York reduce hand-held phone use. Report No. DOT HS 811-845. Washington, DC: U.S. Department of Transportation.
- 36 Trempel, R. E.; Kyrychenko, S. Y.; and Moore, M. J. 2011. Does banning hand-held cell phone use while driving reduce collisions? *Chance* 24(3):6-11.
- 37 Highway Loss Data Institute. 2010. Texting laws and collision claim frequencies. *HLDI Bulletin* 27(11). Arlington, VA.
- 38 Ranney, T. A.; Harbluk, J. L.; and Noy, Y. I. 2005. Effects of voice technology on test track driving performance: implications for driver distraction. *Human Factors* 47(2):439-54.
- 39 Owens, J. M.; McLaughlin, S.B.; and Sudweeks, J. 2010. On-road comparison of driving performance measures when using handheld and voice-control interfaces for mobile phones and portable music players. Paper No. 2010-01-1036. SAE 2010 World Congress & Exhibition. SAE International: Warrendale, PA.
- 40 Owens, J. M.; McLaughlin, S. B.; and Sudweeks, J. 2011. Driver performance while text messaging using handheld and in-vehicle systems. *Accident Analysis & Prevention* 43(3): 939-47.
- 41 Reagan, I.J. and Kidd, D.G. 2013. Using heirarchical task analysis to compare four vehicle manufacturers' infotainment systems. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 1495-2599. Santa Monica, CA: Human Factors and Ergonomics Society.

42 Strayer, D.L.; Cooper, J.M.; Turrill, J.; Coleman, J.; Medeiros-Ward, N.; and Biondi, F. 2013. Measuring cognitive distraction in the automobile. Washington, DC: AAA Foundation for Traffic Safety.

43 Office of the Federal Register. 2012. National Highway Traffic Safety Administration. Docket no. NHTSA-2010-0053 - Visual manual NHTSA Driver Distraction Guidelines for in-vehicle electronic devices. Federal Register, vol. 77, no. 80, pp. 24764-66. Washington, DC: National Archives and Records Administration.

If you have any questions or if you would like more information, please contact Dr. Steve Baek at email@bluespringchiropractic.com or **(800)-719-4124**

References

<http://www.cure-back-pain.org/car-accident-back-pain.html>

<http://www.eric-jacob.com/malapedia/info-back+pain+sciatica+lumbago+low+back+pain-en-DIVDOS-health.php>

http://www.emedicinehealth.com/back_pain/page9_em.htm#Other%20Therapy

http://www.emedicinehealth.com/back_pain/page10_em.htm