Report

To The Members of The Joint Legislative Oversight Committee on Mental Health, Developmental Disabilities, and Substance Abuse Services, the House of Representatives Appropriations Subcommittee on Health and Human Services and the Senate Appropriations Subcommittee on Health and Human Services

On the Implementation of a Pilot Program to Study the Use of Electronic Supervision Devices as an Alternative Means of Supervision During Sleep Hours at Facilities for Children and Adolescents who Have a Primary Diagnosis of Mental Illness and/or Emotional Disturbance

As Required In SL 2009-490 SECTION 5

The North Carolina Department of Health and Human Services
Division of Health Service Regulation

April 20, 2010

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ATTACHMENTS

Response to Legislative Request

This reports on the implementation of a pilot program to study the use of electronic supervision devices as alternative means of supervision during sleep hours at facilities for children and adolescents. This report is required by S.L. 2009-480, Section 5. A copy of the law is included in Attachment A.

The Department of Health and Human Services, Division of Health Service Regulation (the Division) has been working since the passage of S.L. 2009-480 to gather information necessary to evaluate the utilization and effectiveness of safety camera systems as an alternative means to monitor nighttime activities instead of requiring overnight staff to be awake. Current rules require the minimum number of direct care staff during child or adolescent sleep hour to be as follows:

- For one to four children or adolescents: two direct care staff shall be present and one shall be awake.
- For five to eight children or adolescents: two direct care shall be present and both shall be awake.
- For nine to twelve children or adolescents: three direct care staff shall be present of which two shall be awake.

These rules are codified in 10A NCAC 27G.1700. Attachment B contains the rules related to Residential Treatment Staff Secure for Children or Adolescents.

Implementation Status Report

The Division selected Grandfather Home for Children in Banner Elk to use as the pilot. This facility was selected because it is the only one operating under an approved waiver to utilize security cameras in the cottages in lieu of awake staff during sleep hours. Under this waiver, Grandfather Home for Children has real-time monitoring of safety cameras as well as staff asleep in the cottages should the need arise for staff intervention or assistance. Grandfather Home was first granted this waiver effective October 28, 2008.

As a first step in this pilot evaluation effort, the Division has reviewed all survey reports, prior waiver requests including supporting material submitted by Grandfather Home to establish a baseline for this pilot.

As a second step in this process the Division along with the Division of Mental Health, Developmental Disabilities and Substance Abuse (DMH/DD/SA) have reviewed the request received from Grandfather Home to renew its waiver of Rule 10A NCAC 27G.1704(c) allowing the continued use of their safety camera system in lieu of awake direct care staff during sleep hours. DMH/DD/SA recommended approval and the Division concurred. The renewal was approved by the on December 30, 2009.

In 2009 Grandfather Home commissioned a research project to compare safety cameras with overnight awake staff as nighttime client security systems. The research was conducted by Dr. Douglas A. Waring, Professor of Experimental Psychology at Appalachian State University. Grandfather Home shared a copy of the research results with the Division on January 6, 2010, for use in the analysis of the pilot program. Dr. Waring stated that his study provides significant evidence of the superiority of safety camera system over the overnight awake staff for the children's safety and security in the Grandfather Home for Children. Attachment C contains the report.

The Division and DMH/DD/SA are working jointly on this initiative. Additional research may be required if the review of the current study does not provide sufficient data needed to support a recommendation.

Next Steps

After relevant data have been gathered and reviewed, a work group will be convened to begin discussion of possible rule revisions as required by Session Law 2009-490 Section 6. The work group will be made up of stakeholders that will include the following: Division staff, staff from DMH/DD/SAS, representatives from Grandfather Home as well as other providers licensed under 10A NCAC 27G. 1700, LME representatives, advocacy groups, provider associations and others who have an expressed interest in this pilot. Based on the its review and analysis of available research, the work group will report to the Commission for Mental Health, Developmental Disabilities, and Substance Abuse and make rule change recommendations. The Commission may chose to promulgate related rules.

The time frame has the work group beginning its effort mid year 2010 with it reporting to the Commission with recommendations so that rules could be in place by the end of the pilot program which is scheduled to end December 31, 2012.

ATTACHMENT A

S.L. 2009-480

SECTION 4. The Department of Health and Human Services, Division of Health Service Regulation shall establish a pilot program to study the use of electronic supervision devices as an alternative means of supervision during sleep hours at facilities for children and adolescents who have a primary diagnosis of mental illness and/or emotional disturbance. The pilot program shall be implemented at a facility currently authorized to waive the requirement set forth in 10A NCAC 27G .1704(c) or any related or subsequent rule or regulation by the Commission for Mental Health, Developmental Disabilities, and Substance Abuse Services setting minimum overnight staffing requirements. The waiver shall remain in effect until December 31, 2012; however, the Division reserves the right to rescind the waiver if, at the time of the facility's license renewal, there are outstanding deficiencies that have remained uncorrected upon follow-up survey, that are related to electronic supervision.

SECTION 5. The Department of Health and Human Services shall report on the implementation of the pilot program described in Section 4 of this act, including any findings and recommendations to the Joint Legislative Oversight Committee on Mental Health, Developmental Disabilities, and Substance Abuse Services, the House of Representatives Appropriations Subcommittee on Health and Human Services, the Senate Appropriations Committee on Health and Human Services, and the Fiscal Research Division not later than April 10, 2010.

SECTION 6. G.S. 143B-147(a)(2) reads as rewritten:
"(a) There is hereby created the Commission for Mental Health, Developmental Disabilities, and Substance Abuse Services of the Department of Health and Human Services with the power and duty to adopt, amend and repeal rules to be followed in the conduct of State and local mental health, developmental disabilities, substance abuse programs including education, prevention, intervention, screening, assessment, referral, detoxification, treatment, rehabilitation, continuing care, emergency services, case management, and other related services. Such rules shall be designed to promote the amelioration or elimination of the mental illness, developmental disabilities, or substance abuse problems of the citizens of this State. Rules establishing standards for certification of child care centers providing Developmental Day programs are excluded from this section and shall be adopted by the Child Care Commission under G.S. 110-88. The Commission for Mental Health, Developmental Disabilities, and Substance Abuse Services shall have the authority:
...
(2) To adopt rules for the licensing of facilities for the mentally ill, developmentally disabled, and substance abusers, under Article 2 of Chapter 122C of the General Statutes. These rules shall include all of the following:
a. Standards for the use of electronic supervision devices during client sleep hours for facilities licensed under 10A NCAC 27G. 1700 or any related or subsequent regulations setting licensing standards for such facilities.
b. Personnel requirements for facilities licensed under 10A NCAC 27G.

1700, or any related or subsequent regulations setting licensing standards for such facilities, when continuous electronic supervision that meets the standards established under sub-subdivision a. of this of this subdivision is present."

SECTION 7. Sections 1 and 2 of this act become effective January 1, 2010. The remainder of this act is effective when it becomes law.
In the General Assembly read three times and ratified this the 11th day of August, 2009.

ATTACHMENT B

SECTION .1700 - RESIDENTIAL TREATMENT STAFF SECURE FOR CHILDREN OR ADOLESCENTS

10A NCAC 27G .1701 SCOPE

(a) A residential treatment staff secure facility for children or adolescents is one that is a free-standing residential facility that provides intensive, active therapeutic treatment and interventions within a system of care approach. It shall not be the primary residence of an individual who is not a client of the facility.

(b) Staff secure means staff are required to be awake during client sleep hours and supervision shall be continuous as set forth in Rule .1704 of this Section.

(c) The population served shall be children or adolescents who have a primary diagnosis of mental illness, emotional disturbance or substance-related disorders; and may also have co-occurring disorders including developmental disabilities. These children or adolescents shall not meet criteria for inpatient psychiatric services.

(d) The children or adolescents served shall require the following:

(1) removal from home to a community-based residential setting in order to facilitate treatment; and

(2) treatment in a staff secure setting.

(e) Services shall be designed to:

(1) include individualized supervision and structure of daily living;

(2) minimize the occurrence of behaviors related to functional deficits;

(3) ensure safety and deescalate out of control behaviors including frequent crisis management with or without physical restraint;

(4) assist the child or adolescent in the acquisition of adaptive functioning in self-control, communication, social and recreational skills; and

(5) support the child or adolescent in gaining the skills needed to step-down to a less intensive treatment setting.

(f) The residential treatment staff secure facility shall coordinate with other individuals and agencies within the child or adolescent's system of care.

History Note: *Authority G.S. 122C-26; 143B-147;*
Eff. April 3, 2006 pursuant to E.O. 101, Michael F. Easley, March 27, 2006;
Pursuant to G.S. 150B-21.3(c), a bill was not ratified by the General Assembly to disapprove this rule.

10A NCAC 27G .1702 REQUIREMENTS OF QUALIFIED PROFESSIONALS

(a) Each facility shall utilize at least one direct care staff who meets the requirements of a qualified professional as set forth in 10A NCAC 27G .0104(18). In addition, this qualified professional shall have two years of direct client care experience.

(b) For each facility of five or less beds:

(1) the qualified professional specified in Paragraph (a) of this Rule shall perform clinical and administrative responsibilities a minimum of 10 hours each week; and

(2) 70% of the time shall occur when children or adolescents are awake and present in the facility.

(c) For each facility of six or more beds:

(1) the qualified professional specified in Paragraph (a) of this Rule shall perform clinical and administrative responsibilities a minimum of 32 hours each week; and

(2) 70% of the time shall occur when children or adolescents are awake and present in the facility.

(d) The governing body responsible for each facility shall develop and implement written policies that specify the clinical and administrative responsibilities of its qualified professional(s). At a minimum these policies shall include:

(1) supervision of its associate professional(s) as set forth in Rule .1703 of this Section;
(2) oversight of emergencies;
(3) provision of direct psychoeducational services to children or adolescents;
(4) participation in treatment planning meetings;
(5) coordination of each child or adolescent's treatment plan; and
(6) provision of basic case management functions.

History Note: *Authority G.S. 122C-26; 143B-147;*
Eff. April 3, 2006 pursuant to E.O. 101, Michael F. Easley, March 27, 2006;
Pursuant to G.S. 150B-21.3(c), a bill was not ratified by the General Assembly to disapprove this rule.

10A NCAC 27G .1703 REQUIREMENTS FOR ASSOCIATE PROFESSIONALS

(a) In addition to the qualified professional specified in Rule .1702 of this Section, each facility shall have at least one full-time direct care staff who meets or exceeds the requirements of an associate professional as set forth in 10A NCAC 27G .0104(1).

(b) The governing body responsible for each facility shall develop and implement written policies that specify the responsibilities of its associate professional(s). At a minimum these policies shall address the following:

(1) management of the day to day day-to-day operations of the facility;
(2) supervision of paraprofessionals regarding responsibilities related to the implementation of each child or adolescent's treatment plan; and
(3) participation in service planning meetings.

History Note: *Authority G.S. 122C-26; 143B-147;*
Eff. April 3, 2006 pursuant to E.O. 101, Michael F. Easley, March 27, 2006;
Pursuant to G.S. 150B-21.3(c), a bill was not ratified by the General Assembly to disapprove this rule.

10A NCAC 27G .1704 MINIMUM STAFFING REQUIREMENTS

(a) A qualified professional shall be available by telephone or page. A direct care staff shall be able to reach the facility within 30 minutes at all times.

(b) The minimum number of direct care staff required when children or adolescents are present and awake is as follows:

(1) two direct care staff shall be present for one, two, three or four children or adolescents;
(2) three direct care staff shall be present for five, six, seven or eight children or adolescents; and
(3) four direct care staff shall be present for nine, ten, eleven or twelve children or adolescents.

(c) The minimum number of direct care staff during child or adolescent sleep hours is as follows:

(1) two direct care staff shall be present and one shall be awake for one through four children or adolescents;
(2) two direct care staff shall be present and both shall be awake for five through eight children or adolescents; and
(3) three direct care staff shall be present of which two shall be awake and the third may be asleep for nine, ten, eleven or twelve children or adolescents.

(d) In addition to the minimum number of direct care staff set forth in Paragraphs (a)-(c) of this Rule, more direct care staff shall be required in the facility based on the child or adolescent's individual needs as specified in the treatment plan.

(e) Each facility shall be responsible for ensuring supervision of children or adolescents when they are away from the facility in accordance with the child or adolescent's individual strengths and needs as specified in the treatment plan.

History Note: *Authority G.S. 122C-26; 143B-147;*
Eff. April 3, 2006 pursuant to E.O. 101, Michael F. Easley, March 27, 2006;
Pursuant to G.S. 150B-21.3(c), a bill was not ratified by the General Assembly to disapprove this rule.

10A NCAC 27G .1705 REQUIREMENTS OF LICENSED PROFESSIONALS

(a) Face to face clinical consultation shall be provided in each facility at least four hours a week by a licensed professional. For purposes of this Rule, licensed professional means an individual who holds a license or provisional license issued by the governing board regulating a human service profession in the State of North Carolina. For substance-related disorders this shall include a licensed Clinical Addiction Specialist or a certified Clinical Supervisor.

(b) The consultation specified in Paragraph (a) of this Rule shall include:
(1) clinical supervision of the qualified professional specified in Rule .1702 of this Section;
(2) individual, group or family therapy services; or
(3) involvement in child or adolescent specific treatment plans or overall program issues.

History Note: *Authority G.S. 122C-26; 143B-147;*
Eff. April 3, 2006 pursuant to E.O. 101, Michael F. Easley, March 27, 2006;
Pursuant to G.S. 150B-21.3(c), a bill was not ratified by the General Assembly to disapprove this rule.

10A NCAC 27G .1706 OPERATIONS

(a) Each facility shall serve no more than a total of 12 children and adolescents.

(b) Family members or other legally responsible persons shall be involved in development of plans in order to assure a smooth transition to a less restrictive setting.

(c) The residential treatment staff secure facility shall coordinate with the local education agency to ensure that the child's educational needs are met as identified in the child's education plan and the treatment plan. Most of the children will be able to attend school; for others, the facility will coordinate services across settings such as alternative learning programs, day treatment, or a job placement.

(d) Psychiatric consultation shall be available as needed for each child or adolescent.

(e) If an adolescent has his 18th birthday while receiving treatment in the facility, he may remain for six months or until the end of the state fiscal year, whichever is longer.

(f) Each child or adolescent shall be entitled to age-appropriate personal belongings unless such entitlement is counter-indicated in the treatment plan.

(g) Each facility shall operate 24 hours per day, seven days per week, and each day of the year.

History Note: *Authority G.S. 122C-26; 143B-147;*
Eff. April 3, 2006 pursuant to E.O. 101, Michael F. Easley, March 27, 2006;
Pursuant to G.S. 150B-21.3(c), a bill was not ratified by the General Assembly to disapprove this rule.

10A NCAC 27G .1707 PERSONS PERMITTED IN THE FACILITY

(a) Only admitted children or adolescents, legally responsible persons, staff, other family and friends identified in the treatment plan, and others permitted by the facility director shall be permitted on the premises.

(b) Individuals other than those specified in Paragraph (a) of this Rule are prohibited from entering the facility except in instances of emergency or as permitted by law.

History Note: *Authority G.S. 122C-26; 143B-147;*
Eff. April 3, 2006 pursuant to E.O. 101, Michael F. Easley, March 27, 2006;
Pursuant to G.S. 150B-21.3(c), a bill was not ratified by the General Assembly to disapprove this rule.

10A NCAC 27G .1708 TRANSFER OR DISCHARGE

(a) The purpose of this Rule is to address the transfer or discharge of a child or adolescent from the facility.

(b) A child or adolescent shall not be discharged or transferred from a facility, except in case of emergency, without the advance written notification of the treatment team, including the legally responsible person. For purposes of this Rule, treatment team means the same as the existing child and family team or other involved persons as set forth in Paragraph (c) of this Rule.

(c) The facility shall meet with existing child and family teams or other involved persons including the parent(s) or legal guardian, area authority or county program representative(s) and other representatives involved in the care and treatment of the child or adolescent, including local Department of Social Services, Local Education Agency and criminal justice agency, to make service planning decisions prior to the transfer or discharge of the child or adolescent from the facility.

(d) In case of an emergency, the facility shall notify the treatment team including the legally responsible person of the transfer or discharge of the child or adolescent as soon as the emergency situation is stabilized.

(e) In case of an emergency, notification may be by telephone. A service planning meeting as set forth in Paragraph (c) of this Rule shall be held within five business days of an emergency transfer or discharge.

History Note: *G.S. 122C-26; 143B-147;*
Eff. April 3, 2006 pursuant to E.O. 101, Michael F. Easley, March 27, 2006;
Pursuant to G.S. 150B-21.3(c), a bill was not ratified by the General Assembly to disapprove this rule.

ATTACHMENT C

Grandfather Home for Children Project

Comparison of Safety Camera and Overnight Awake Staff as Nighttime Client Security Systems

Research Consultant
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Abstract
Grandfather Home for Children in Banner Elk, North Carolina currently uses a Safety Camera System (SCS) to monitor the nighttime activities of the children in residence at the site. The current study was designed to compare the effectiveness of the SCS to a system utilizing Overnight Awake Staff (OAS). In this study, the nighttime activities of 22 children divided between 3 separate cottages (Douglass, Neale, and Hickory) were monitored with the SCS for three consecutive two-week periods (phase 1-3). Effectiveness was determined by the relative number of activities recorded by each system, each evening. General activity types are provided in Appendix 1 with category distinctions dependent on the level of risk to the child. During phase 1 baseline behavioral data was collected. During phase 2 the children in Neale cottage were informed that the SCS was "undergoing some repairs" and that overnight-awake staff (OAS) would be added to their cottage to handle security, the same was done in Hickory cottage during phase 3. In fact the SCS was never off and was used to continue recording behavioral data while the OAS was in the cottages. Analysis of the SCS time-series data revealed no significant impact of factors external to the studies design suggesting that any behavioral changes during phases 2 and 3 could be attributed to the change in security systems; SCS to OAS. Comparison of the nighttime activities recorded by SCS and OAS security systems, in both Neale and Hickory cottages, revealed that the SCS was superior to the OAS system in every analysis. In particular, the SCS outperformed the OAS system in detecting total activity levels and more importantly detected important variability in nighttime activities and greater levels of risky C and D activities than the OAS system. Consequently, the current study provides significant evidence of the superiority of a SCS over and OAS system for the children's safety and security.

Contents

Douglas A. Waring, Ph.D. is a professor of Experimental Psychology at Appalachian State University. Dr. Waring may be reached at 828-262-2738 or via e-mail: waringda@appstate.edu.

Study Methodology

Setting: The current study was conducted between August 11th and September 21st of 2009 at Grandfather Home for Children (GHC) located in Banner Elk, North Carolina. GHC is a Level III residential treatment facility for sexually abused and sexually reactive children. The campus in Banner Elk has six residential cottages licensed to provide care and treatment for eight to nine children each. Since 1998 GHC has utilized a Safety Camera System (SCS), rather than Overnight Awake Staff (OAS), to monitor the children's activities during sleep hours.

As currently designed the SCS relies on cameras and motion detectors located in each room in each cottage. Two employees from Securitas Inc. monitor the feeds from each camera in a separate building and the motion detectors alert the guards to activity in a particular room. Once alerted, the guards monitor the activity and determine whether the activity requires notification of staff sleeping in the cottage. Appendix 1 provides a list of typical activities and whether they require staff notification. If the activity is within those listed in category C or D (see appendix 1) then cottage staff is contacted by telephone and the staff responds to the child's room. The purpose of the current study was to test the efficacy of the Safety Camera System as compared to Overnight Awake Staff.

Participants: The activities of 22 children in 3 cottages were monitored and recorded over a period of 42 days. The children for this study were 7 girls in Douglass cottage (age range 11 - 17, mean 13.5), 7 boys in Neale cottage (age range 15 - 17, mean 15.4), and 8 boys in Hickory cottage (age range 10 - 17, mean 14.3).

Study Design: A 3x3x14 mixed-factor reversal design was utilized for the current study. The relevant variable were: Cottage (Douglass, Neale, Hickory), Monitoring phase (SCS data recorded over 3, 2 week periods), and Night (14 nights within each 2 week phase, 42 nights total). Each cottage was monitored for 3 successive 14 day periods utilizing the SCS. During the first 2 weeks data on the activity of the children in each of the three cottages was recorded to provide a behavioral baseline. All children and staff (GHC and Securitas) were kept unaware of any aspect of the study and its intent during this period. The OAS was added to Neale cottage during the second 2-week period and Hickory cottage during the third 2-week period to create the reversal design.

The reversal design was used in order to account for any possible "history effects". History effects are events, beyond those specifically applied in the current study, which could cause behavior change on the part of participants. Specifically, the OAS will be in two different cottages over two different time frames. If we find variability in the observation and/or occurrence of the children's activity over each of the two distinct periods (but not at other times) then it would argue against events external to the study being the cause of those changes.

The dependant variable for this study was the observed and recorded activities of each child in each cottage. Each activity was categorized as one of three types of activity: type A were allowable activities such as "bathroom trip" or "drink of water"; type C were activities that required staff intervention such as "emotional distress" and "keeping self awake"; and type D were considered risky activities that required staff intervention such as "child leaves room" and "injury or damage danger".
Procedure: As shown in Table 1, the nighttime activity of each child in each cottage was monitored and recorded by the SCS for the entire six weeks of the study (August 11th through September 21st, 2009). Also shown in Table 1, OAS was added to Neale cottage upon completion of the first 2 week period and monitored the cottage for 14 consecutive nights (phase 2, August 25th through September 7th 2009). At the end of phase 2, the OAS moved to Hickory Cottage and monitored activity in the cottage for another 14 consecutive nights (phase 3, September 8th through September 21st 2009).

Table 1. Pattern of security system in use for each cottage during each phase of the study.

Cottage	Phase 1	Phase 2	Phase 3
Neale	SCS	SCS & OAS	SCS
Hickory	SCS	SCS	SCS & OAS
Douglass	SCS	SCS	SCS
SCS: Safety Camera System		OAS: Overnight Awake Staff	

Two staff were contracted to perform the duties of OAS for the four weeks necessary for completion of the study. The OAS was instructed in the use of the observation recording system used by the SCS staff and told to record any night time activities noted, whether they required staff intervention or not. The OAS staff was instructed to remain in the hallways throughout the entire night and to look into, but never enter, each room approximately every 15 minutes. Similar to the SCS protocol, the OAS were to observe the behavior and awaken the in-cottage staff if the activity was within those listed in category C or D (see appendix 1). However, regardless of activity type, they were to make a record of the activity in the log (similar to that kept by Securitas Staff) kept in the cottage. These log entries would serve as the OAS data for the current study.
The children and cottage staff, both in-cottage and OAS, were unaware that the camera system was fully staffed and functioning during the entire period of the study. The instructions to the children and cottage staff replicated aspects of the instructions developed by Dr. Houck for use in a 2007 in-house comparison of the SCS and OAS security systems. On the day that OAS was to begin monitoring their cottage, the children and cottage staff was informed that *"the camera system was undergoing some repairs and that the cameras might not be working continuously for a two week period. Because the reliability of the camera system during that period was not predictable, two contracted staff would be assigned*

to work as overnight staff within the cottage during this two week period". The children were assured that *"the overnight awake staff would not enter their rooms and if they had a problem or if the OAS observed unacceptable behavior the OAS would notify the in-cottage staff who would address the problem just as if they had been notified by the SCS staff".*

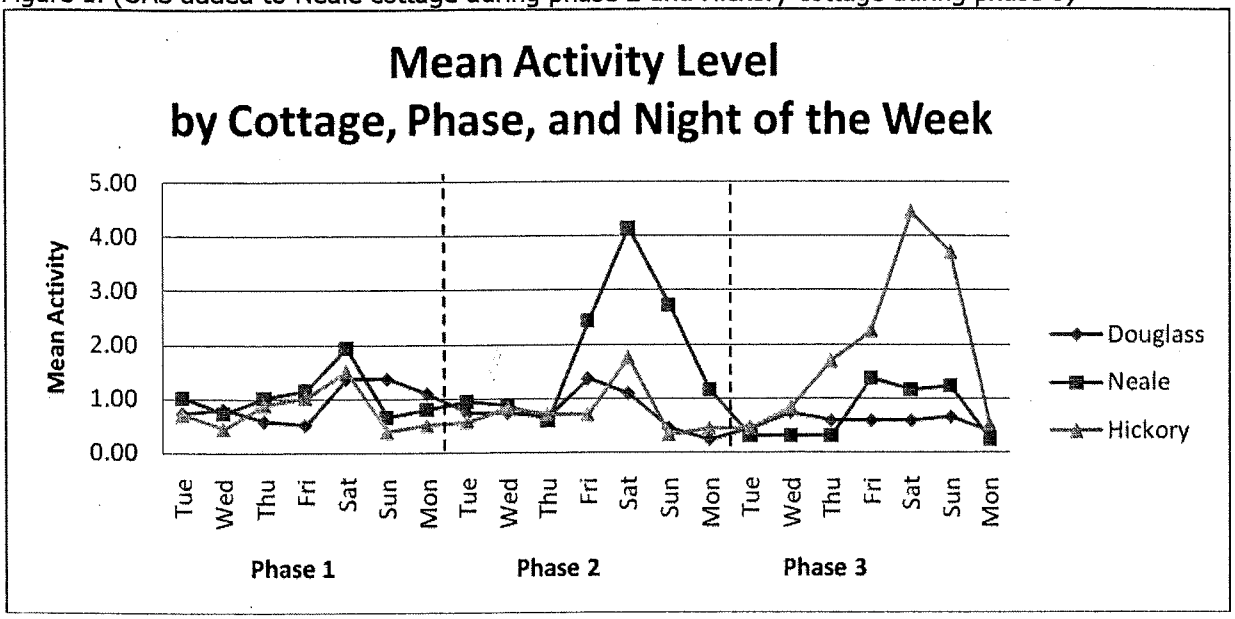
Securitas Staff were only told that OAS would be added to a couple of the cottages on a trial basis. They were instructed that this had no impact on their duties and that they should continue to monitor and record the activities of the children as usual but to phone in-cottage staff only if a child's activity posed an immediate risk to safety.

Safety Camera System Time-Series Analysis

The data of interest for the time-series Analysis was the recorded activities of each child each evening by the SCS staff. For the purposes of these analyses three separate data sets were constructed based on the activity types listed in Appendix 1. The first dataset was Total Activities created by aggregating the data across all activity types. The second analysis was based only on type A (allowed) activities. The third analysis was based on the aggregated type C & D activities. The aggregation was done because of the relative infrequency of type D behaviors. For each analysis the data was submitted to a 3x3x14 mixed Analysis Of Variance (ANOVA) to determine if the children's behavior in each cottage was stable across the three 2-week phases.

The ANOVA on Total activity revealed a significant main effect of Night $(13, 247) = 6.63$, $p < .001$; a significant Night by Cottage interaction $F (26, 247) = 1.58$, $p < .05$; a significant Night by Phase interaction $F (26, 494) = 2.43$, $p = .000$; and a significant Phase by Cottage interaction $F (4, 38) = 8.97$, $p = .000$. However, the main effect and two-way interactions were qualified by a significant three-way Night by Phase by Cottage interaction $F (52, 494) = 2.78$, $p = .00$. Planned comparisons showed that the effect of Night occurred for each Friday, Saturday, and Sunday of Phase 2 in Neale Cottage only and on Thursday, Friday, Saturday, and Sunday of Phase 3 in Hickory Cottage only. The mean activity levels for the Night by Phase by Cottage interaction are shown in Figure 1. Please note that because of graph size constraints, and clarity, the data for week one and two of each phase was averaged across night of the week (Monday, Tuesday,... Sunday). This was deemed appropriate because activity levels did not differ for each night of the week (Monday week 1, Monday week 2, etc.) within a given phase.

Figure 1. (OAS added to Neale cottage during phase 2 and Hickory cottage during phase 3)



To determine if the effects found for Total activity levels resulted from a particular class of activity the analysis was repeated for allowable activities (type A) and for activities that require staff intervention (type C & D). The analysis of allowable activities (type A) only revealed a significant main effect of Night $F(13, 247) = 4.76$, $p = .000$. However, the main effect of Night was qualified by a Night by Phase interaction $F(26, 494) = 1.65$, $p = .023$ which post hoc analyses revealed was a result of increased type A activities on the weekends of each phase.

The analysis of activities that required staff intervention (type C & D) replicated the findings for Total activities with the addition of a main effect of cottage $F(2, 19) = 10.12$, $p = .001$ which, again was qualified by a significant Night by Phase by Cottage interaction with the same pattern demonstrated in Figure 1.

Conclusions: Time-Series Analysis

The purpose of the SCS time-series analysis was to determine whether any external events or circumstances occurred that could provide alternative explanations for the results of primary interest to this study, comparison of the SCS and OAS security approaches. To accomplish this we were looking for relatively stable behavior patterns across the entire six weeks of data collection with the only deviations isolated to the cottage where the children believed their camera system to be shut down. Fortunately, for the purposes of the current study, the SCS time-series analysis appears to confirm such a finding.

Increased nighttime activity on Friday, Saturday, and Sunday during Phase 2 was found for the Neale Cottage and Thursday, Friday, Saturday, & Sunday for Phase

3 for the Hickory Cottage. The children in Neale Cottage believed the camera system was off during Phase 2 and the children in Hickory Cottage believed the camera was off during phase 3. As reflected in Figure 1, the only times we saw significant increases in night activity was during phase 2 involving the children in Neale cottage and in phase 3 involving the children in Hickory cottage. It is important to note that there is no significant variability between any of the three cottages during the first two weeks of the study when no one, staff or children, was aware that data was being collected. In addition, it should be noted that the increased activity level in Neale cottage returned to baseline levels after the children were told the camera system was back on. Finally, there was no change in activity levels in Douglass cottage (control) during the periods when OAS was added to Neale and Hickory cottages.

The data across the 42 nights of the study appears to reflect relatively stable behavior with no identifiable external influences. Therefore, it can be reasonably assumed that any changes in behavior during the SCS-OAS comparison in Neale cottage (phase 2) and Hickory cottage (phase 3) are a product of the perceived security system in effect at that point in time and are not the result of uncontrolled external factors.

SCS-OAS Comparison

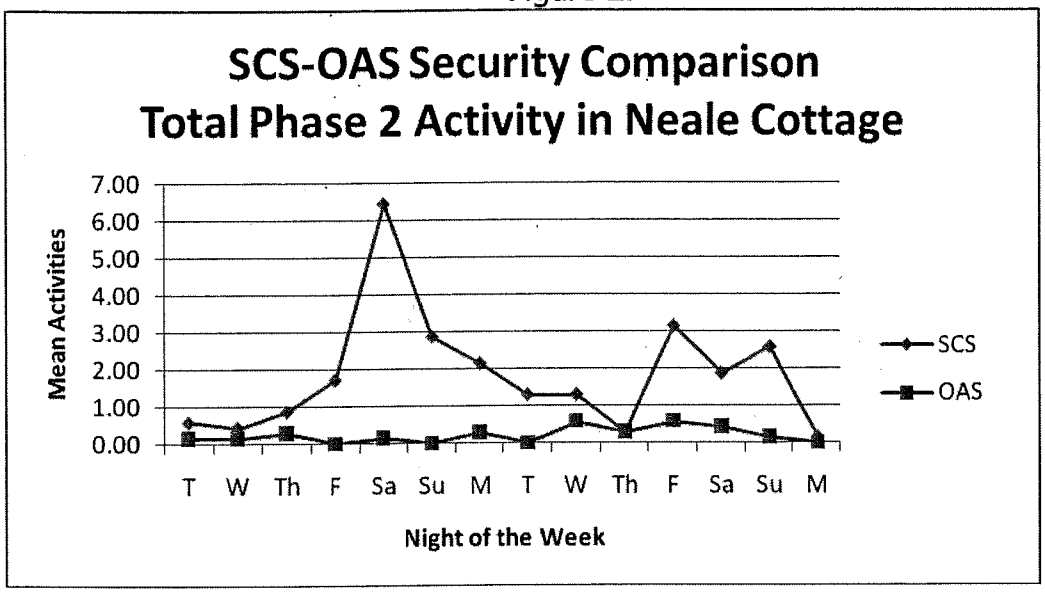
Neale Cottage, Phase 2

The data of interest for the current analysis are the separate SAS and OAS recorded activities of the children in Neale Cottage during phase 2. Separate datasets were created for Total activities; type A (allowable) activities; and type C-D (alert cottage staff) activities. Each dataset was submitted to a 2 by 14 mixed ANOVA.

Total Activities:

The ANOVA on Total activities in Neale Cottage revealed significant main effects of Night, $F(13, 156) = 3.34$, $p = .000$, and Security System, $F(1, 12) = 8.69$, $p = .003$. However, the main effects were qualified by a significant Night by Security System interaction, $F(13, 156) = 3.26$, $p = .000$. Planned comparisons revealed that the SCS was associated with significantly more activities than the OAS on every night except Tuesday, Wednesday, and Thursday of the first week and Wednesday and Thursday of the second week. Figure 2 shows the Night by Security System interaction results for Total Activities.

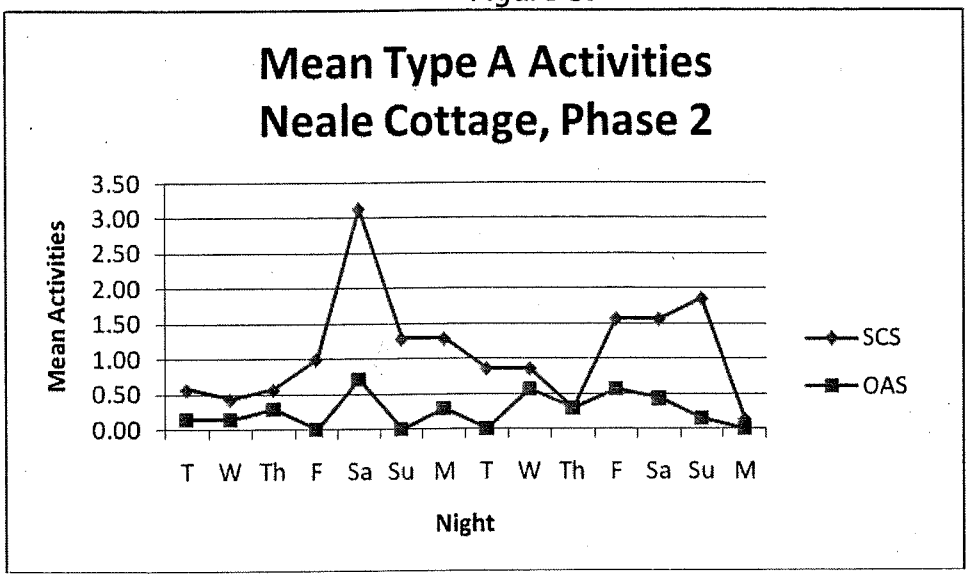
Figure 2.



Type A Activities:

The ANOVA on type A activities in Neale Cottage revealed a significant main effect of Night, $F(13, 156) = 3.20$, $p = .000$, and Security System, $F(1, 12) = 12.97$, $p = .04$. The Night by Security System interaction approached but did not reach significance $F(13, 156) = 3.26$, $p = .08$. However, because the Night by Security System interaction, though not reaching significance, was consistent with the interactions in the Total and type C-D analyses Figure 3 presents the pattern of activity that occurred in the type A interaction.

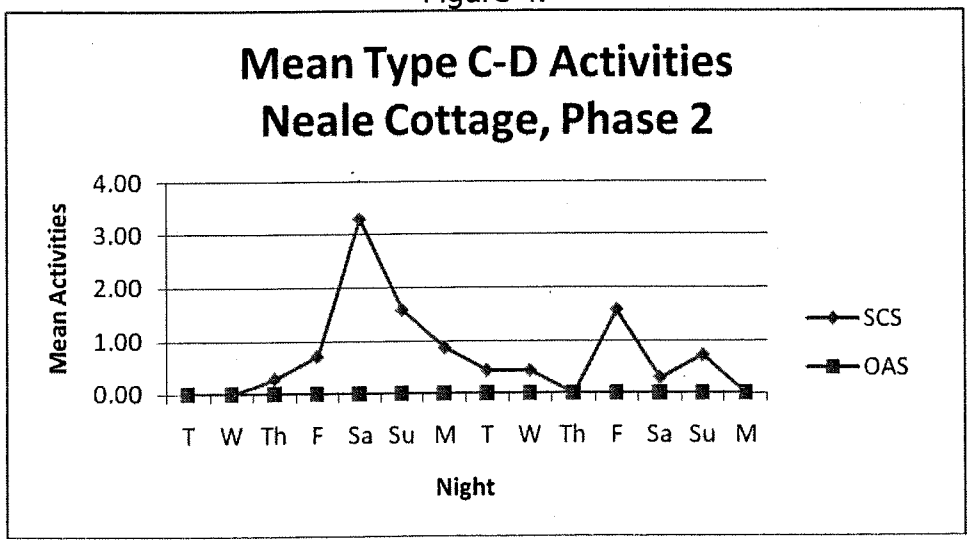
Figure 3.



Type C-D Activities:

The ANOVA on type C-D activities in Neale Cottage revealed significant main effects of Night, $F(13, 156) = 3.80$, $p = .000$, and Security System, $F(1, 12) = 11.53$, $p = .005$. However, the main effects were qualified by a significant Night by Security System interaction, $F(13, 156) = 3.80$, $p = .000$. Planned comparisons revealed that the SCS recorded significantly more activities on every night except Tuesday, Wednesday, and Thursday of the first week and Thursday and Monday of the second week. Figure 4 shows the Night by Security System interaction results for type C-D Activities.

Figure 4.



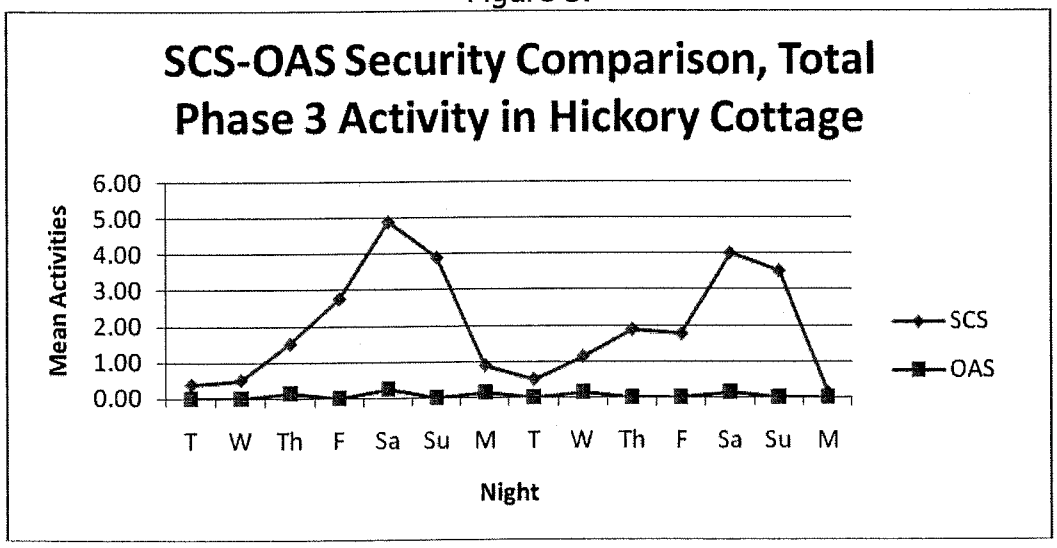
Hickory Cottage, Phase 3

The data of interest for the current analyses are the separate SAS and OAS recorded activities of the children in Hickory Cottage during phase 3. Separate datasets were created for Total activities; type A (allowable) activities; and type C-D (alert cottage staff) activities. Each dataset was submitted to a 2 by 14 mixed ANOVA.

Total Activities:

The ANOVA on Total activities in Hickory Cottage revealed significant main effects of Night, $F(13, 182) = 4.05$, $p = .000$, and Security System, $F(1, 14) = 25.67$, $p = .000$. However, the main effects were qualified by a significant Night by Security System interaction, $F(13, 182) = 9.33$, $p = .000$. Planned comparisons revealed that the SCS recorded significantly more activities than the OAS on every day except Tuesday and Wednesday of the first week and Tuesday and Monday of the second week. Figure 5 shows the Hickory Cottage Night by Security System interaction results for Total Activities.

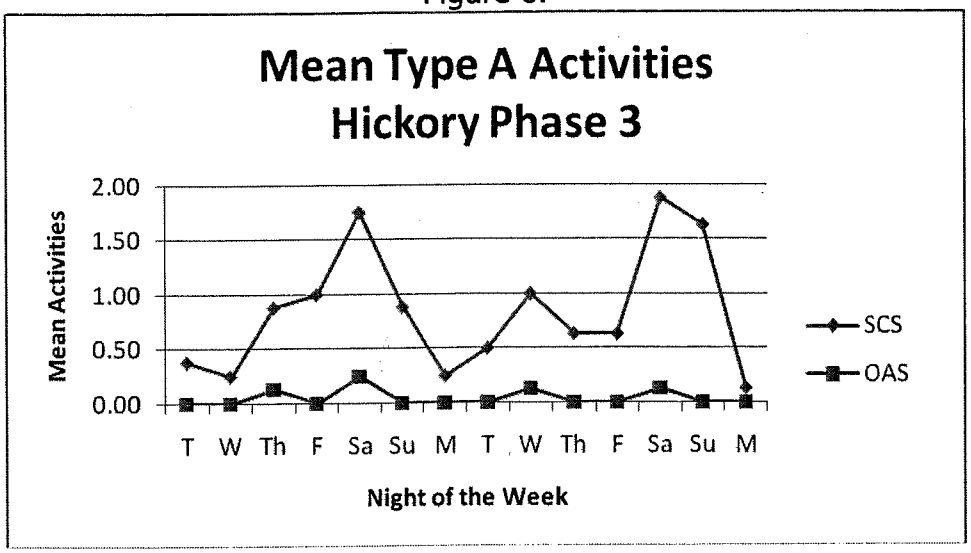
Figure 5.



Type A Activities:

The ANOVA on type A activities in Hickory Cottage revealed a significant main effect of Security System, $F(1, 14) = 10.32$, $p = .007$. The SCS recorded significantly more activities than the OAS everyday of the phase. However, for consistency the graph resulting from the Night by Security System data is presented in Figure 6.

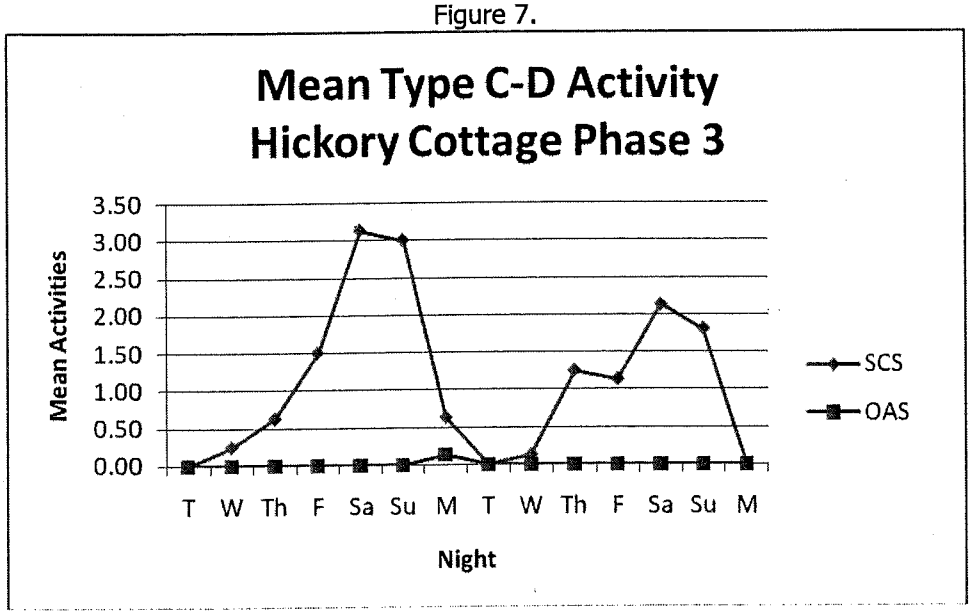
Figure 6.



Type C-D Activities:

The ANOVA on type C-D activities in Hickory Cottage revealed significant main effects of Night, $F(13, 182) = 6.00$, $p = .000$, and Security System, $F(1, 14) = 39.48$, $p = .000$. However, the main effects were qualified by a significant Night by Security System interaction, $F(13, 182) = 6.10$, $p = .000$. Planned comparisons revealed that the SCS recorded significantly more activities than the OAS on every night except Tuesday and Wednesday of the first week and Tuesday, Wednesday, and Monday of the second week. Figure 7 shows the Night by Security System interaction results for type C-D Activities.

Figure 7.



Conclusions: SCS-OAS comparison

The purpose of the SCS-OAS analysis was to determine the relative effectiveness of each system in detecting the nighttime activities of the children in the affected cottages. Because the pattern of data is consistent across both Neale and Hickory cottages the conclusions will be generalized across both cottages.

Across all analyses it is clear that the SCS was significantly more effective at detecting and recording the nighttime activities of the children. However, because the children sleep in separate rooms it was expected that the SCS would detect generally greater numbers of behaviors than the OAS system, simply because SCS monitoring was continuous (cameras present in each room) and OAS monitoring was intermittent (staff intermittently looking into each room). However, looking beyond the general finding, two issues with significant safety implications are of particular interest:

1. SCS-OAS relative effectiveness in detecting variability in nightly activity levels.

The Overnight Awake Staff were clearly much less sensitive to fluctuations in activity levels. If only the OAS system was in affect it would appear that nightly activity levels remain relatively stable across each night of the week (see Figures 2 - 7). In contrast, it is clear from the Safety Camera System data that nighttime activity levels are prone to increase dramatically on weekends. Even more interesting is the finding that the SCS system is effective in both detection and moderation of activity levels. Specifically, when the children believe they are being continuously monitored their weekend activity levels remain relatively low. In contrast, when the children believe the cameras are off the increase in weekend activity levels is dramatic. As can be seen in Figure 1, nightly activity levels more than doubled when the children believed the SCS was off and, as can be seen in Figures 2 - 7, this dramatic change in activity was not detected by the OAS. Thus it appears that the presence of the SCS provides for both better detection and, perhaps just as important, has a significant impact in limiting nightly activity levels just because of its presence. Consequently, it is reasonable to conclude that the presence of the SCS improves the relative safety of the children by both detecting and limiting nighttime activities.

2. SCS-OAS relative effectiveness in detecting different types of activities.

The implications for the safety of the children become even clearer when detecting different types of behavior. Type A activities are "allowable" and type C and D behaviors carry consequences when detected by staff. Specifically, there is relatively less risk to the safety of the children when engaged in type A activities but the safety risk clearly increases when they are engaged in type C and D activities. It is reasonable to assume that the children would want to avoid staff

detection for type C and D behaviors and be relatively unconcerned about detection of type A behaviors. Once again the analyses make clear the superiority of the SCS over the OAS system. As can be clearly seen in Figures 3 and 4 for Neale cottage and Figures 6 and 7 for Hickory cottage, not only did the SCS detect more total activities than the OAS but it also was superior at detecting type C and D behaviors. Specifically, while type C and D activity levels are lower than type A activity levels, the pattern of detection does not change within the SCS comparison. This is definitively not the case for the OAS analysis where virtually all of the activities detected were type A (allowable) activities. In fact, the OAS recorded only 1 instance of type C and D activity in the two cottage monitored, compared to 127 instances recorded by the SCS.

In conclusion, the findings in the current study, for the Grandfather Home setting, provide clear support for the effectiveness of the Safety Camera System as opposed to an Overnight Awake Staff system of nighttime security. In this setting, the SCS outperformed the OAS system in detecting total activity levels and more importantly detected important variability in nighttime activities and greater levels of risky C & D activities than the OAS system. Consequently, the current study provides significant evidence of the superiority of the Safety Camera System over an Overnight Awake Staff system for the children's safety and security.

Appendix 1

Activity Codes

Allowed – do not awake staff	Code
Bathroom trip	A1
Hand washing	A2
Drink of water	A3
Retrieve toy / blanket	A4
Adjust window	A5
Awake staff and enter detail of event	
Nightmare / talking	C1
Emotional distress	C2
Keeping self awake	C3
Awake staff and enter detail of event	
Interactions with roommate – voice or signals	D1
Child leaves bedroom	D2
Injury or damage danger	D3